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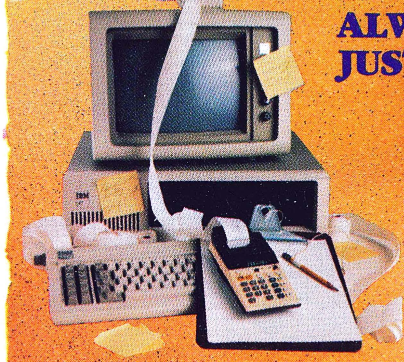

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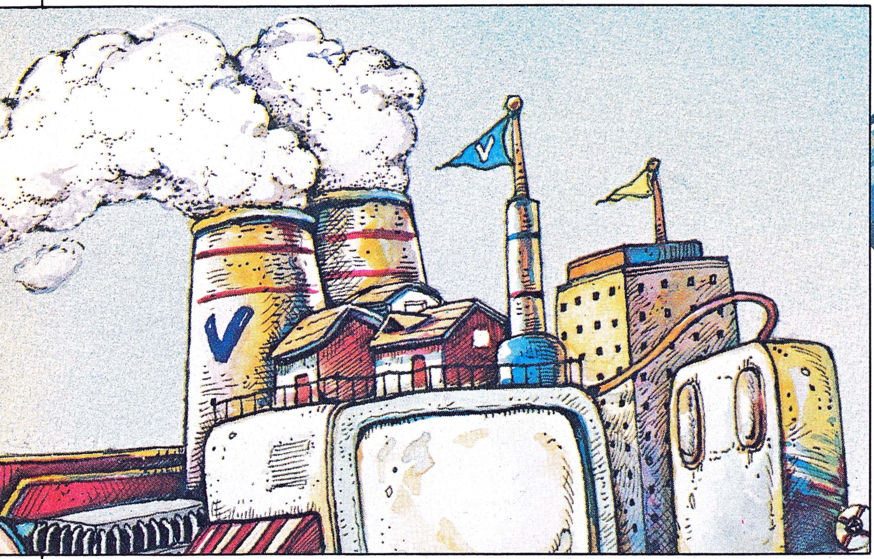
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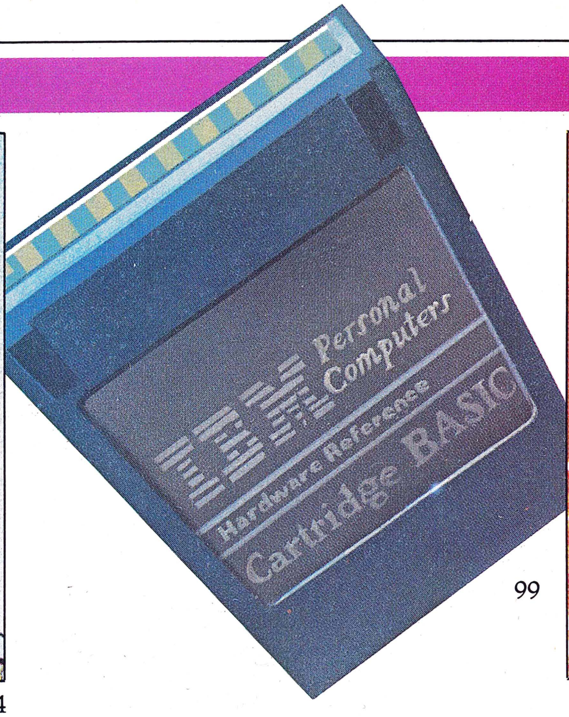

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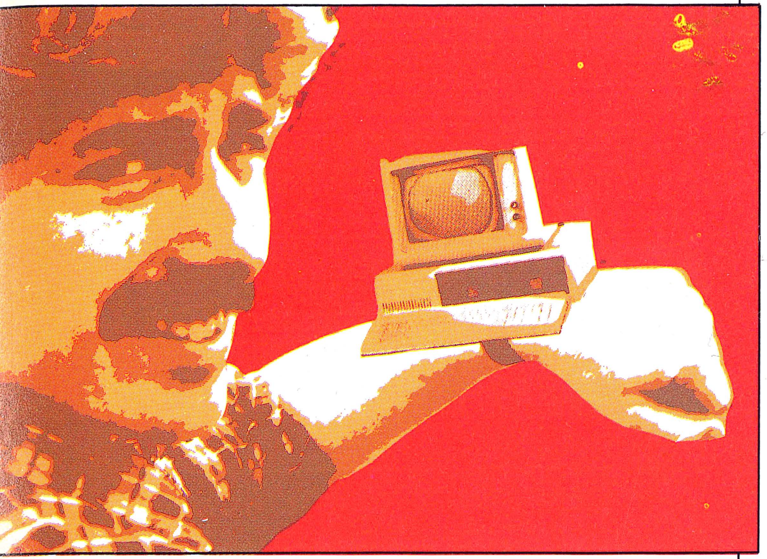

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The EROM Memorandum

In the cutthroat PC*jr* cartridge market, some companies stop at nothing to gain the upper hand. Corporate espionage is a way of life for these hardened men and women. The fit survive.

Annapurna Software and Death Valley Development Corporation are racing to develop the first cartridge that can be eaten after a consumer tires of the program. Both companies have realized that one technical difficulty stands in the way of achieving EROM (Edible Read-Only Memory).

Fortunately for the folks at Death Valley, one of their spooks knows where the answer to the problem can be found. For security reasons, the information is sent in an encrypted cable.

Alas, the cunning Annapurnites have intercepted the message. Seeing EROM as their only hope of reviving the ailing sales of *Yowling Yeti,* they rush the mysterious message to their top cryptographer. She's a defector from Death Valley who played a key role in the development of that company's popular *Boron Moron.*

"You'd better not double-cross us," says Sir Hillary-Smith, Annapurna's director emeritus, a man who has climbed all the way to the top.

"Don't worry," says the cryptographer. "I wouldn't want to make you a cross man! I'll have the answer in five minutes."

The message is reproduced here in its entirety:

"Slurp," said the odile fakir to his tyros. "If you want amino acid like Mr. Lenin has, you must try harder. Karma is not something you can determine by fetal development. The optic nerves of the rhino are an important totem for many African tribes. So are hysop [sic] plants. Elihu was no idiot; he was a bloke with a miter."

*****

You guessed it. We want you to decipher the message. If the writer of *Boron Moron* can do it, so can you! You won't earn the gratitude of Sir Hillary-Smith, but you might be the recipient of $100 in software from the advertisers in this issue. Be advised, however: You must uncover the entire message.

Send the answer, preferably on a post card, to Gold Bug, Softalk for the IBM Personal Computer, Box 7040, North Hollywood, CA 91605, by August 15. If more than one spy deciphers this mess, we'll rely on our secret random decoder generator ring to choose a winner. ▲

CROSSTALK

Yikes, We Did It Again!

There's a typo in figure 2 of the June issue's "Pascal from Begin to End" (page 111). Alas, the typo has had more than ordinarily distressing consequences. The program in figure 2 was supposed to tell you whether you had the earliest version of Turbo Pascal—which had a bug that limited the precision of real numbers—or a revision. If you ran the program and got a nonzero result, you had the unfixed version.

Unfortunately, because we printed the last line of the *for* loop as *e := d - 1* instead of *e := d - a*, a whole lot of people concluded that they had buggy Turbos, and a whole lot of people did a whole lot of bugging of the good folks at Borland International.

We apologize to all those readers who were misled and inconvenienced by our error, and we apologize to Borland for the havoc we wrought. Here is how figure 2 should have looked:

```
PROGRAM reals;
VAR
  a,b,c,d,e               : real;
  indx                    : integer;
  ch                      : char;
BEGIN
  write('Hit any key to continue: ');readln(ch);
  a := 0.0;
  FOR indx := 1 TO 100 DO BEGIN
    a := a + 1.0;
    b := (a*a*a);
    c := b / a;
    d := sqrt(c);
    e := d - a
  END;
  writeln(chr(7),'e = ',e:12:7)
END. {of PROGRAM reals }
```

The Good News. Uncle! We've seen the error of our ways. We have superb typesetters, great keyboarders, excellent proofreaders, and terrific copy editors—and still we make errors in programs. Hence there'll be no more typeset programs in *Softalk IBM*. This month is a transition issue; you'll find some programs typeset and others "shot" from correspondence-quality matrix output. Next month all programs will be error-free (knock-knock) and printed out. Your feedback about this decision is welcome.

—*Ed*

PCs and Hospital Beds

I've read that the magnetic fields of X-ray machine motors can wipe out a disk's contents. Because of a back injury, I'll have to use my PC while supine for several months. An electric hospital bed would be very helpful to me, but I am concerned that the motor will adversely affect my disks or computer. The motors of motorized wheelchairs should be similar to this motor, and I'd like to hear from people using motorized wheelchairs or motorized hospital beds about their experiences using this equipment around personal computers and disks. Please contact me care of Softalk, Box 7040, North Hollywood, CA 91605.

Cheryl Ellis, Farmington Hills, MI

***1-2-3* is Number 10**

The Lotus-in-Love syndrome is so strong that I've never heard anyone complain of bugs in it. While there's no point chasing bugs for pleasure, the bugs should be reported when found so as not to inconvenience other users. Here are some I've recently encountered, and I'd love to hear of remedies for them.

Bug 1. Start with an empty worksheet. Go to cell B4 (for example) and type */RU* to unprotect this cell. Go to cell C4 and type *+B4 *2*. Return to cell B4 and type 2. Cell C4 displays 4. Now issue the command */WGRM* to set recalculation to manual. Define the range A1. . .E10 with */RNC* and give it the name *test*. Finally, issue the */RItest~* command. The pointer goes to cell B4. Type *4*. Cell B4 displays 4, and cell C4 still displays 4 as well.

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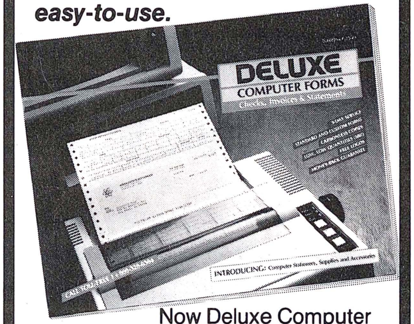
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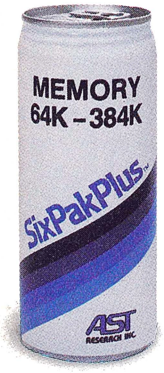
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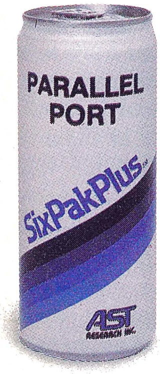
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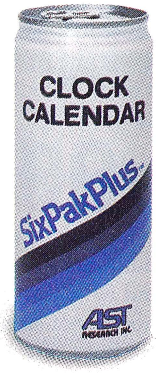
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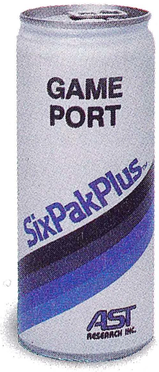
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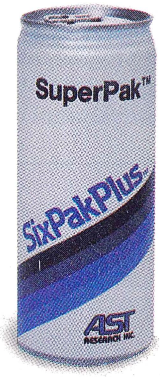
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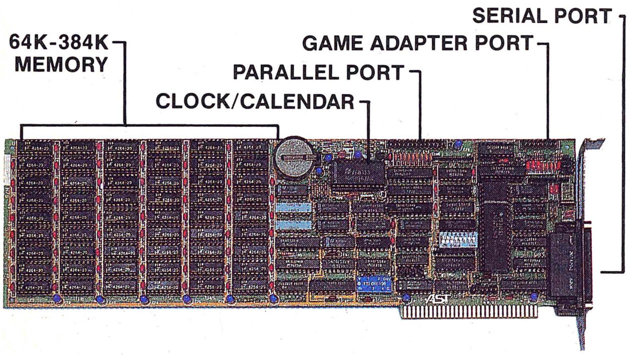
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Dealer Inquiries Welcome

This is expected, but note that the Calc indicator doesn't light up as it should (when you're in manual recalculation, this indicator is your only warning that the worksheet has been updated but not recalculated). Try now to update the worksheet with the F9 key: *1-2-3* beeps at you.

This bug is annoying, since *range input* should help you design forms, and the manual (page 167) specifically suggests that the only keys active during the *range input* command are F1, F2, and F9. Clearly this is a bug. The solution (although not elegant) is to place the *calc* command right after the *range input* in your macro so that when you get out of *range input* your worksheet will be recalculated. However, doing it this way means you don't get the benefit of seeing the result of your input. A second pass through the worksheet allows you to see this result, but then you have to wait for another recalculation when you get out.

Bug 2. Printing triple density (high quality) on the Epson MX-80 works fine if you print one graph at a time, but if you want to batch-process several graphs, a horrible bug creeps in. The graph program counts only sixty-five lines per page (instead of sixty-six), and the graphs progressively shift to the right (or to the top of the page) until they overlap the perforation. Trying to fool the computer into believing that the MX-80 is an FX-80 won't work; trying to redefine the page length won't work either.

Bug 3. One busy Sunday I produced 194 graphs and had no luck batch-processing them. *1-2-3* isn't prepared to deal with many graphs and refuses to display them for your selection when you want to start the printing program. *1-2-3* initiates the selection process, then returns to you without displaying the usual graph menu. No error message appears, and you are left wondering if all your work has been zapped. If you go into the file manager program, you won't have any problem getting those graphs displayed.

The solution, which is very cumbersome, is to get rid of some of the graphs by temporarily placing them in a second subdirectory. It would be nice to use the file manager to do this; unfortunately, *1-2-3* doesn't allow you to copy from one subdirectory to another, probably a relic of the pre-hard-disk period. The only solution is to exit to DOS and copy (with wildcards) related graph files to the second subdirectory. This is slow and memory-consuming, since you temporarily need to store your files twice. After transferring the picture files to the second subdirectory, you have to delete them from the original subdirectory, a very hazardous procedure! Note that this can be done with the file manager program, and it can be speeded up if you first sort the directory by date/time as the primary key and by the extension as the secondary key. Both should be sorted in descending order. Try to keep a printout of the directory to ensure that you erase the right files. When you've reduced the number of graph files to fewer than a hundred, print a first batch of graphs. When done, move the graph that you just printed into a third subdirectory and transfer the files you temporarily exiled with the *copy* command to the first subdirectory.

Bug 4. Fortunately, this bug is less of a nuisance than the other three. When using the file manager program, you can't—in a single session—delete a file and rename another to the name of the file you just deleted. To see for yourself, get into your *1-2-3* subdirectory and copy any of your worksheets to another name. For example:

```
COPY INTEREST.WKS PERIODA.WKS
```

Return to file manager and erase PeriodA. Now try to rename Interest to PeriodA. An error message will tell you that the selected filename is already in use and that you should hit enter to try another name or hit escape to exit.

Philippe Jeanty, New Haven, CT

Stew Kaplan, *1-2-3* support manager, replies: *Mr. Jeanty's first problem, not being able to do a recalculation while using* /range input, *isn't a program bug. A recalculation can't be done while you are in the middle of any menu manipulation. Using* /range input *requires that you press return to get out of input mode (which is part of menu mode) before recalculating. This shouldn't really be an inconvenience to users, since Mr. Jeanty states that he wants to use* /range input *for entering data into a form. Typically, when entering data in this manner, the final results aren't important until all the data are entered. As soon as this is done, you can press return, the calc light will go on, and you can have the worksheet recalculated.*

The manual does say that the F9 key is active during /range input. *This is an error in our documentation, not an error in the program.*

The second problem cited is real. We are aware of this problem but have no solution at this time.

The third problem mentioned by Mr. Jeanty is memory-related. The number of graph (pic) files one can list, as well as the number of graphs one can select for batch printing, is directly related to the amount of RAM in the user's computer. The bug, in this case, is that the PrintGraph program doesn't display the error message "Memory Full" when the user tries to

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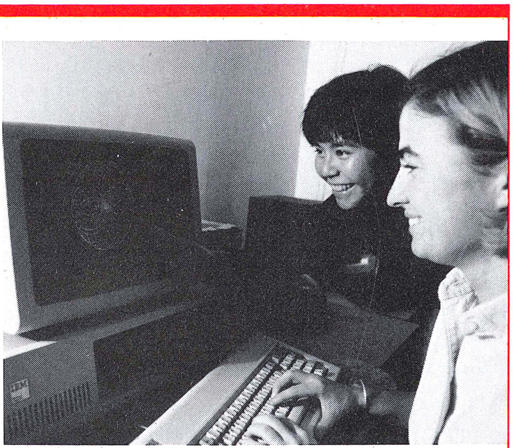

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process too many files at one time. The solution is to reduce the number of files in the directory by copying some of the files into a different directory, thus allowing more room for file selection.

The fourth problem doesn't seem to be a problem at all. We have used several computers to try to re-create it, but we have been unable to do so. If Mr. Jeanty calls our customer support department, a specialist will be happy to describe the correct procedure.

Password Faux Pas

I hope I'm not sillier than other mortals, but I *still* can't get the corrected version of *Password* (May "Questions & Answers") to run. What am I doing wrong?

Dexter C. Haven, Fullerton, CA

You're not doing anything wrong. In line 1290, try replacing 1340 with 1330; this'll give you the response "Welcome!" rather than taking you to the comment line "destroy system." It should work now—honest. While we're 'fessing up, line 300 of Ray Duncan's assembly listing on page 178 should have read 0FFFH in the fifth column, not =;pl=n=;pl1, and line 1060 on page 105 should have had another −24 to make the checksum work out; the line should have read

```
1060 -24, 0, -24
```

The Big Blue C

At last a computer magazine has found someone to write about C who understands the language! Nonetheless, there are two points I would like to raise concerning the May "C Spot."

First, Jaeschke seems to have neglected an important caveat in his discussion of macro functions: the problems that arise when macro arguments have side effects. Consider an example macro *toupper,* which converts characters to their uppercase equivalents. This macro can be defined as

```
#define toupper (c) (('a' <= c &&
c <= 'z') ? c + 'A' - 'a' : c)
```

The macro checks to see if the argument is lower case; if it is, it subtracts the lowercase offset. This works well as long as the macro's argument is variable but fails miserably if the argument is a call to a function such as *getchar().* In this case, the expansion of *toupper* becomes

```
(('a' <= getchar() && getchar() <= 'z') ? \
getchar() + 'A' - 'a' : getchar())
```

Note that the function *getchar()* is called at least twice, and possibly three times, depending on which path is taken through the conditional. Since *getchar()* has the side effect of stripping a character from the input buffer as well as returning it (what we want in most cases), the returned value of *toupper* depends on the first two or three characters in the input buffer. Thus

```
c = toupper(getchar()); /*this won't work*/
```

should be changed to

```
c = getchar(); /*this will work*/
c = toupper(c);
```

This type of error is extremely difficult to catch unless the preprocessor will display expanded macros, as some do. Also, both forms above will work if *toupper* is written as a function instead of a macro.

Second, and less important, it's somewhat difficult to read the example functions when they're broken up between columns or pages. Two examples are the functions *main()* and *sub()* on page 149. To my mind, this is akin to putting a heading at the bottom of a column with no text beneath it, something no decent editor would do. On the other hand, I like the idea of the examples being part of the text rather than separate figures, so I'm not sure you can do anything to solve this problem.

Keep up the good work.

Donald T. Hayford, Columbus, OH

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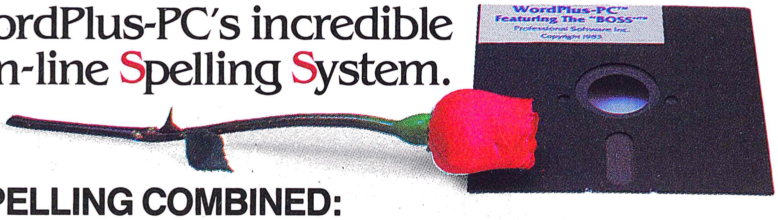

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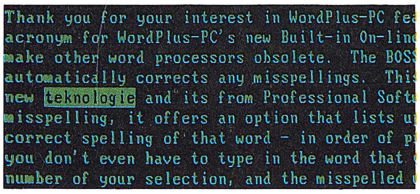

```
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misspelling, it offers an option that lists u
correct spelling of that word - in order of p
you don't even have to type in the word that
number of your selection, and the misspelled
```

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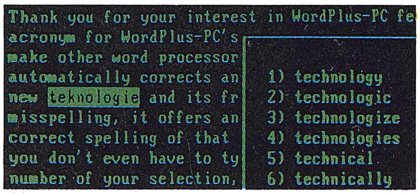

```
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acronym for WordPlus-PC's
make other word processor
automatically corrects an    1) technology
new teknologie and its fr    2) technologic
misspelling, it offers an    3) technologize
correct spelling of that     4) technologies
you don't even have to ty    5) technical
number of your selection,    6) technically
```

When a word is misspelled, the user can ask The "BOSS" for suggestions as to how to correctly spell the word. With only one keystroke, The "BOSS" will display, in a dynamic on-screen window, up to eight *spelling suggestions in the order of probable phonetic correctness.*

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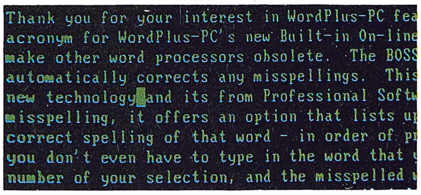

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tions must reside in the second slot: the 64/256K Memory Expansion option, IBM PC Cluster Adapter, and Expansion Unit 001 "Hard Disk." If you want that hard disk, you can't have more than 256K of memory; so, no PC/IX or any program using more than 256K (such as *Symphony*). The IBM Product Center has refunded my money, and I have ordered an XT.

Peter A. Hanson, Arlington, TX

Marketalk Correction

I would like to thank you for mentioning *Mini-Ledger* in your April 1984 "Marketalk News." However, there was one rather important error: *Mini-Ledger* doesn't require CP/M-86. It will run under PC-DOS 2.0 (128K), MS-DOS 1.25 (128K), CP/M-80 (64K), and CP/M-86 (128K). It also requires at least one disk drive and an eighty-column display.

Dale Blanchard, Paradigm Consultants,
Fremont, CA

Science and Engineering and PCs

I just ordered my first paid subscription to *Softalk* after receiving a year for free (thanks for the free year). Your magazine is more valuable than most because of its sections on Pascal, assembly, C, utilities, and so on. I was really delighted to see that you are starting a new section on scientific and engineering uses of the PC. Since I am a physicist, this is obviously of interest to me. It was also very good to see the article on cosmology ("Newspeak," March 1984), although it really had almost nothing to do with the precise way machines are being used in the simulations. Perhaps in the future you can give more details on exactly how computers are being used in science and engineering, much as in your "Analytical Engine" series.

Victor Mansfield, Burdett, NY

APL and Statistics

Bruce Filbeck's introductory review of two APL systems (March 1984) was very helpful. *Softalk* readers will be interested, I think, in a third APL system available for the PC: STSC, Inc. (2115 East Jefferson Road, Rockville, MD 20852) has a fine APL system. I looked at three APL systems quite closely several months ago and concluded that the STSC system offered the best features for an APL environment on the PC. It is fast, offers up to 576K of addressable RAM, has good manuals, and the company gives speedy responses to users' questions.

An additional benefit of the system is that it can support an excellent statistical graphics package, *Statgraphics.pc* (available from Statistical Graphics Corporation, 1101-H State Road, Princeton, NJ 08540). *Statgraphics.pc* is a professional-level interactive statistics package with integrated graphics. I would recommend that readers requiring a professional statistical package inquire about this system. I've found this APL environment and interactive statistical graphics to be a fine arrangement for my demographic and epidemiological research.

Both SPSS and BMDP—two leading mainframe statistical software systems—have announced plans to release versions of their systems for the PC within the next four or five months, and PC users needing a professional statistical package will find several more to choose from shortly.

Barry Edmonston, Ithaca, NY

The Right To Assemble

Ref: Mark.exe, February 1984 "The Right To Assemble." Another listing that doesn't work. Line 136 on page 174 should be looking for '\' = 2fH; the program never puts a CR there. Thank goodness for T86. Why not a .com file? I'll try tomorrow, and I bet it's half as big. Why set normal, instead of archive? I do like your series; *Softalk* is worth it to me for that series alone.

Ronald E. Frank, Tampa, FL

Ray Duncan replies: *Thank you for your post card regarding the Mark.exe utility. I am a bit disturbed by your comment that it's "another listing that doesn't work." We attempt to test the programs thoroughly before they appear in print. I certainly wouldn't claim that they don't contain* any *bugs, but I do feel confident that the* major *blunders have been eliminated.*

Your comment about line 136 is clearly in error. Dumps from Trace86 *and* PC/Forth *independently demonstrate that PC-DOS 2.0 always puts a carriage return at the end of the command-line tail in the Program Segment Prefix. Thus, the code printed in* Softalk *was perfectly correct. It's true that the switch provided by the user will also be copied into the local filename buffer; however, it's ignored by DOS's filename parser, so no harm is done—and the cases where the switch is forgotten don't require special handling.*

I agree with you that .com files are more compact and load faster than .exe files. However, I am stressing .exe files in the column because sophisticated assembly programs are usually written in that form, so it's beneficial for readers to become familiar with it; it's a subtle but effective way to make the readers comfortable with the 8088's segmented memory architecture.

Compressing Compiler Source Code

In the April 1984 "Questions & Answers" column, Alan W. Jones noted that he ran out of working storage while using the IBM Basic compiler to compile a fairly large program. While the suggestion to look at the *chain* command was correct in general, there are some problems in using the *chain* command in concert with the */o* option.

A simpler solution to the problem may be to compress the source code prior to using the compiler. By compress, I mean combine as many commands on a single line as possible and remove comments and unnecessary line numbers. The compressing can be done manually or by means of software designed for this purpose. There are several programs available to compress Basic programs, some in the public domain. If you use compressed source code, you should be able to compile extremely large programs without difficulty.

Stephen Flanagan, Rockville, MD

p-System/Fortran Bug

I am writing in the hope of informing owners of the IBM version of the UCSD p-System that there's a definite bug in its Fortran 77 compiler: The compiler can't handle the use of adjustable array dimensions in a call to a subroutine.

When I discovered this problem I informed IBM and was told that there were no plans being made to release a revision of the p-System. Meanwhile, I contacted SofTech Microsystems and was told that as of November 1983 this problem had been resolved.

I recommend that all owners of the IBM ver-

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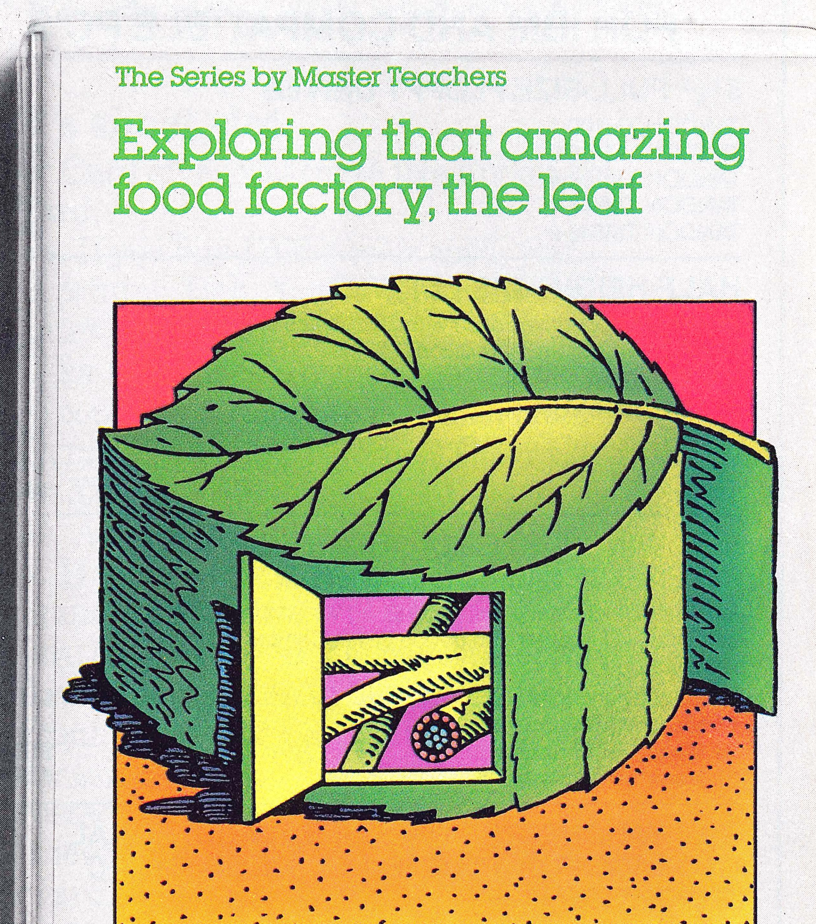
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sion of the p-System complain about lack of support. I think it very unfair that in order to have the UCSD p-System Fortran 77 compiler run properly, one has to purchase the new compiler from SofTech—especially since the original version could handle this.

V. P. Manghacapra, Bridgeport, CT

Testament of a Beginner

As a faithful *Softalk* reader, I've come to value the opportunity to get the advice and wisdom of the old hands of the microcomputing industry. I'm constantly amazed at the sheer quantity of knowledge one needs to exercise the PC's full power, as well as at how much power there is to exercise.

I'm not an old hand—in fact, I've just taken the necessary vows (administered by my local computer dealer) to become a full-fledged novice. I write to pass along some advice based on my recent experience with the use of several Basic utilities and programming tools. This may be common knowledge, but nobody told me.

Usually these commercially produced aids are considered appropriate only for the advanced programmer. I beg to differ. Since starting to use the *Norton Utilities*, *Keytools1 Programmer Utilities*, and *Basic Development System*, I have learned more, produced more, and had more fun than ever.

Reading the *Norton Utilities* manual finally made me understand what files and sectors are and let me look at the bytes covering the surface of that mysterious piece of plastic in the black jacket. Knowing that I could always go in and zap a bad file has made me more confident in coding.

The *Keytools1* package is amazing: Since I bought it, I have used its Picasso ScreenMaker to create very nice screens in every program I write. By using a combination of ScreenMaker and the Basic building blocks it supplies, I've been writing some very professional-looking programs. I was able to use this program within an hour of procuring it.

The *Basic Development System* should be the first program users buy if they plan to write anything in Basic. It includes a way to step through a listing a line or a page at a time; it cross-references variables, numbers, and keywords; it allows realistic renumbering; and it has a super trace utility. I haven't used the compress and expand programs yet, but they look good. It, too, is easy to start using.

I am sure that there are other programs that do similar things: The point is that with a set of utilities like these, Basic becomes much less scary and less complicated. It's much easier to actually create working, useful programs, and, after all, that's the most satisfying part of being an amateur programmer.

Laurie A. Labrecque,
South Dartmouth, MA

Hard Disk Search

Some time ago I realized I needed a hard disk to upgrade my older PC (obtained in the summer of 1982) and started to do my research. I had heard good things about the Maynard hard disk from friends and from *Softalk*, so I ordered one.

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given size loaded. The erratic performance was independent of hardware configuration. Anyhow, I reported all this to Maynard, and they were most helpful.

I finally exchanged the hard disk for another one and even got an extra copy of the EPROM to try. No change—so I returned everything and we called it quits. I must note that Maynard was completely helpful, but we were unable to get the system running; I concluded that the problem was software-related and perhaps related to my PC. Some people have reported difficulties in getting various programs to run on certain PCs, depending on the ROM date. I'd like to alert those readers with older PCs that you really have to be careful when going about adding a hard disk to your system.

I subsequently obtained a Sysgen twenty-megabyte hard disk with tape backup, and it has been a dream. I just plugged it in, followed the directions, and it has purred along ever since.

Morton F. Kaplon, Pomona, NY ▲

CONTEST WINNERS

Last month's printed correction to the previous month's "Think" contest seems to have soothed many a troubled brow and probably saved some marriages, too. Once the errant "A", "B", and "C" were restored, the correct entries poured in from thinkers who had almost given up hope.

Of course, the really heavy thinkers, and there were more than a few, solved the puzzle *before* the correction was printed. Unfortunately, this did not impress the *Softalk* random number generator, which is a singularly unempathetic entity. Therefore, the winner of the "Think" contest is Kelly R. Nolan of Santa Maria, California. Kelly will receive $100 of choice software from the advertisers in the April issue. The luck of the Irish will do it every time.

The eleven synonyms for using one's noggin that Kelly identified were *ponder, meditate, cogitate, ratiocinate, reflect, reason, contemplate, muse, speculate, consider,* and *deliberate*. Most people agreed that ratiocinate was the hardest to decipher. We suspect that may be because it's not in the dictionary of *The Word Plus*, a program that several people assured us *they* wouldn't use, but were certain that everyone else had.

Incidentally, should we ever do another Tangletalk-type contest (believe it or not, several people expressed the hope that we would), we'll be sure to leave out some letters on purpose—for old time's sake. ▲

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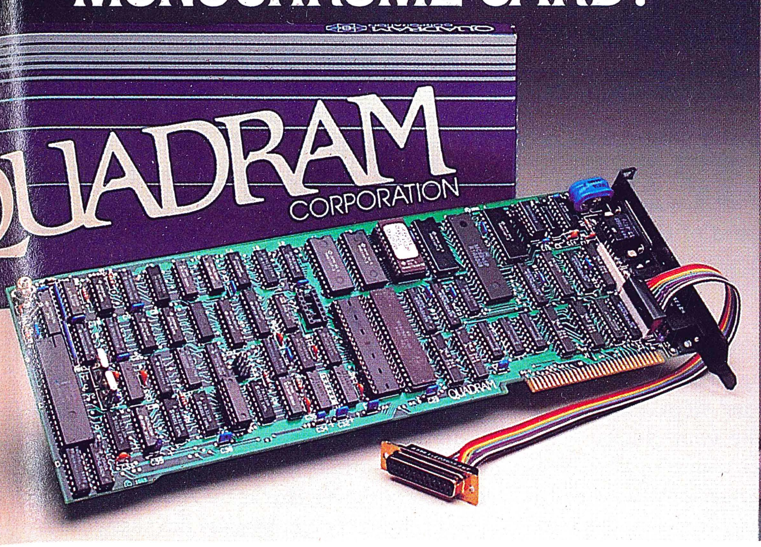

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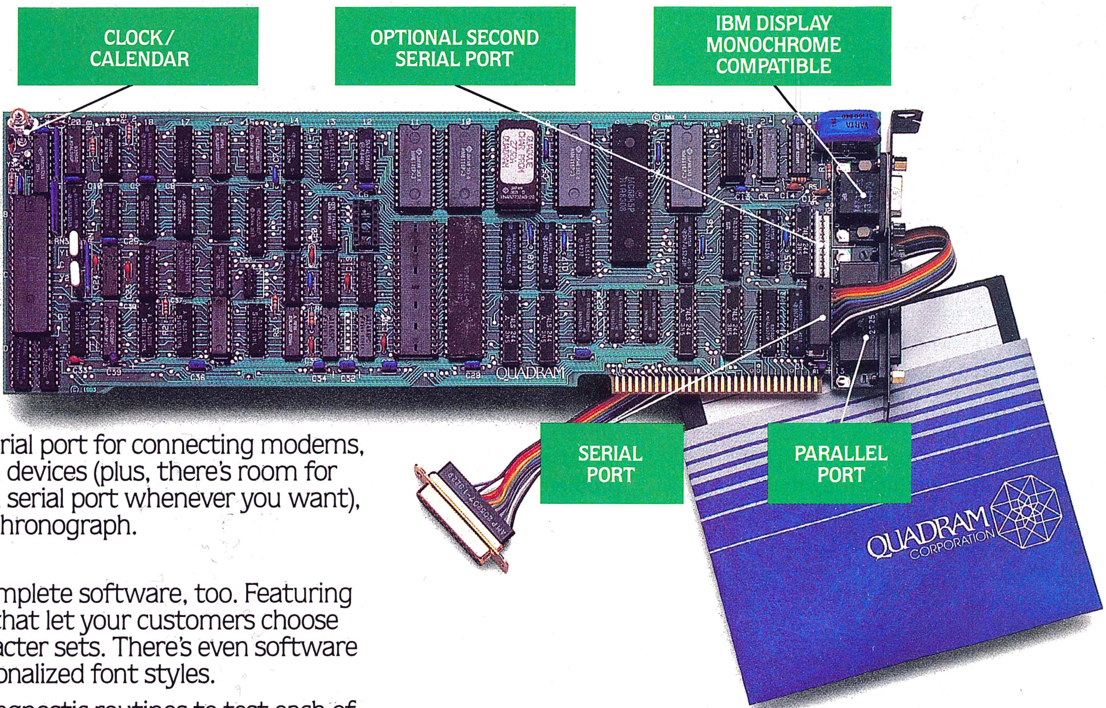
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QUESTIONS & ANSWERS

by Nancy Andrews

Q: I have a PC with 512K—64K on the motherboard, 192K on a Seattle board, and 256K on an AST board. If I set the configuration switches for 448K, everything works fine. However, if I set the switches for 512K, the PC has problems. *Chkdsk* shows that the PC has 524,288 bytes of memory, but when I try to compile a Pascal program with the IBM Pascal Compiler, the compiler bombs and I get a "Computer out of memory" error message. I have checked memory locations 40:13 and 40:14, and they show 0 2, indicating 512K installed. What's causing this problem?

Larry Eugene Foster

A: Your problem is that you've discovered a bug in the IBM Pascal Compiler. Fortunately, there's a patch for this one. Just go to your dealer and have him or her call the IBM Customer Support Hotline; they'll send the patch.

Q: I've come across an apparent error in the SofTech UCSD p-System, version IV. I most often experience this problem when executing the compiler.

I find it most efficient to use the compiler list option *{$L}* to write the compiler output listing to a disk file for later transfer to the printer; I usually use something like *{$L #4:PROGLIST. TEXT}*. I find that if I type ahead something like *Q U R* (quit, update, run) when leaving the editor and updating the file, I get a parity error when the compiler completes writing the text listing to the disk file.

Invoking the filer and examining the disk has always revealed a bad block, normally at the end of the code file. There's no apparent distinction between compiling System.wrk.text or any disk text file; the error always occurs if I type ahead when quitting the editor.

The obvious cure, of course, is for me to slow down and avoid typing ahead. Waiting isn't much fun, but having to fix bad blocks is wretched.

Although I don't know why, it appears the extra characters, *U* and *R* or *U* and *C*, are tacked onto the text file, and the compiler attempts to compile and append them to the code file—something like finding characters in the undefined window or trying to read past EOF. Perhaps you've heard of this particular bug.

F.L. McClellan

A: We contacted SofTech about your problem. Using their version IV compiler, they followed your steps exactly and were unable to duplicate your results. They agreed that what you're trying to do is eminently reasonable; and when they typed ahead *Q U R*, all proceeded normally. They suggested you send them your disk; they'll see if they can reproduce your results and let you know what happens. Send your disk and a short explanation of the problem to Product Support, c/o John Minteer, SofTech Microsystems, 16885 West Bernardo Drive, San Diego, CA 92127.

We encourage you to follow through with this. SofTech is one of the most helpful companies we've dealt with.

Q: I was using an AST print spooler on a PC that was connected to an Epson MX-80, and I was running DOS 1.1; everything worked fine. I added Graftrax chips to the printer, and, while the spooler continued to work, the actual print speed decreased significantly. I've tried the print spooler and DOS 1.1 with other printers and experienced the same problem. The same thing occurs using Quadram's spooler.

I talked with AST. They acknowledged the problem but had no solution. I tried sending various code and escape sequences to the printer, but that didn't change the print speed. I wrote to Epson America and after two months received a message saying they were forwarding my letter to their local distributor. That was a couple of months ago and I still haven't heard anything. I would appreciate any thoughts you might have.

Gerry Fricke

A: We don't have a definitive answer for you, but here are some things you can check to help pinpoint your problem. Is the print speed slower with the Graftrax even when you're not using the spooler? Is there a command in the spooler program that you can change to tell the program that you've added Graftrax? Try running the printer self-test with the cable disconnected at the printer end; compare that speed with the speed at which the printer test runs with the cable connected.

If the printer runs at normal speed when disconnected or when you aren't using the spooler, your problem is most likely software-related, which means it's one for AST, not one for Epson. Generally, a spooler program asks the printer to accept the data it sends and to answer back within a specific time period; if the printer doesn't reply within the specified time, the spooler resends the data. It could be that the resending of data is what's causing the degradation of your print speed; if that's the case, AST should be able to provide a fix.

Q: I read with interest your reply to Robert J. Gody in the March 1984 *Softalk* describing a password program that limits access to his XT. The program you suggested protects against unauthorized access as long as the unauthorized user doesn't have a DOS disk. Since the XT checks the A drive at system power-up, users can by-pass the password by using a different system disk. Do you know any way of forcing the XT to load DOS and the password program from the hard disk?

Joseph H. Kest

A: You found the fatal flaw in our password program. Furthermore, the routine that causes the XT to check the A drive at power-up is built into its ROM BIOS; so there's no way to force a boot from the hard disk other than to change ROM—something only the sophisticated would want to attempt.

However, Security Microsystems (16 Flagg Place, Suite 102S, Staten Island, NY 10304; 212-667-1019) has a product called Lockit, which duplicates the functions of the IBM BIOS except that it doesn't check drive A for Command.com at power-up. Lockit should be available soon at a reasonable price.

Thanks are due to Paul Shafer for putting us in touch with Security Microsystems.

Q: I have a PC with 640K, and my usual computer session revolves around working with a number of different databases. When it's practical, I try to make use of a RAM disk to speed up my work. I don't have the RAM-disk utility as part of my Autoexec.bat file but instead keep it in a separate batch file that I call up when needed. Also, I restrict its use to program files rather than data files because I like to keep my data on the physical drives. Since some programs are copy-protected and can't be copied onto a RAM disk, I have built a Config.sys file on my DOS disk, in which the sole entry is

```
BUFFERS=20
```

This works well with my data files and program overlays when I can't copy a program to the RAM disk. Recently, however, I tried to do a *format b:/s* and was shocked to get an "insu-

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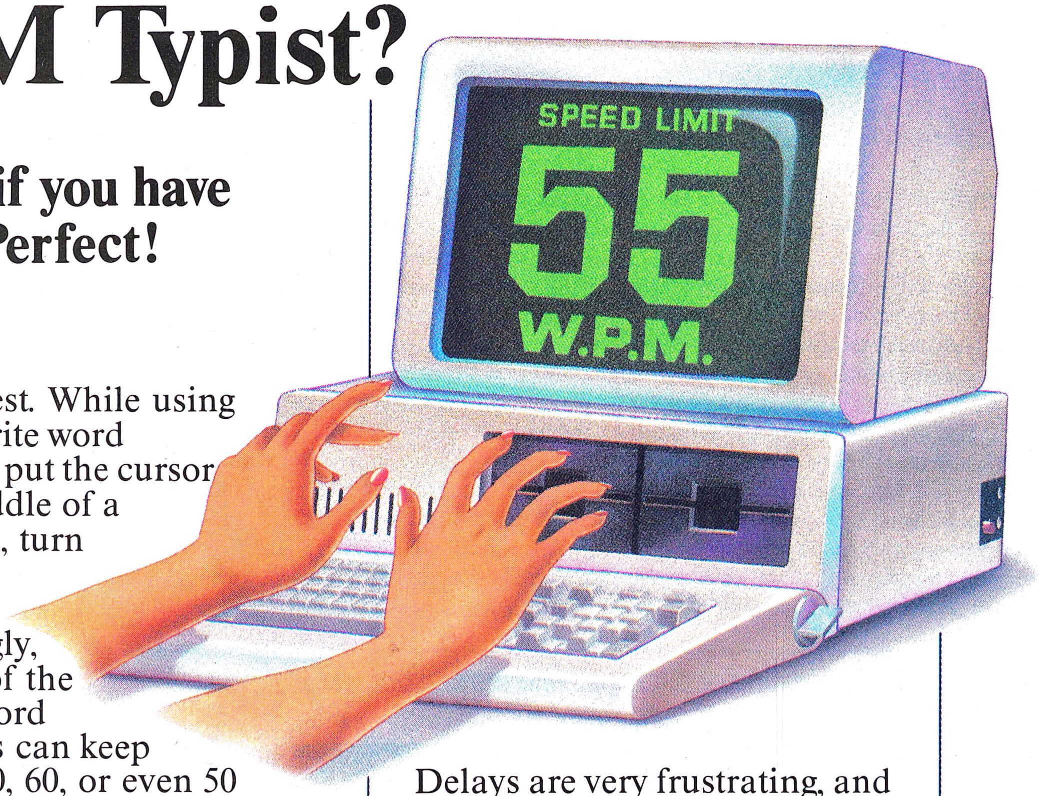

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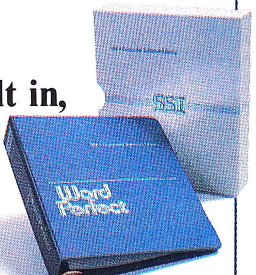

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fficient memory" error message. I rebooted, so that RAM would be clear. *Chkdsk* informed me that I had over 600K free, but I still couldn't do a *format b:/s* with the Config.sys set to twenty buffers. By trial and error, I discovered I could format a disk in drive B if I limited myself to thirteen buffers; at fourteen, the error message returned. With 640K, I just don't understand how this can happen.

Although I fixed my problem, it's driving me crazy not to know why it occurred. I have attempted to talk to Microsoft, but no one there in technical support seems to know. I can't contact anyone holding a technical position at IBM. I hope you can help me get a good night's sleep.

Conrad S. Kageyama

A: Sleep well—there is a known and publicly acknowledged (except, it appears, by Microsoft tech support) bug in the *format* command, which was fixed in DOS 2.1.

There's probably very little performance improvement in going from thirteen to twenty buffers, but you'll have to experiment and see what you think. Try copying what parts of the protected program you can into the RAM disk and leave the floppy in drive A to increase speed. Most of the program will run from the RAM disk, but it'll occasionally need to return to A to refer to the files you couldn't copy.

Q: I have used John Socha's *Scrnsave* (published in *Softalk*, December 1983) for several weeks and find it most useful. I have a PC in my office, and having the screen go dark while someone is in for a chat is valuable—a brightly lighted PC seems to be quite an attractive nuisance. I realize that I can use the monitor controls to achieve the same effect, but I like the idea of letting the computer take care of itself.

All seemed well and good until the other day when a friend walked in and saw I was using *Scrnsave*. He commented, "I'd be careful using that program because so-and-so burned up his monitor using *Scrnsave*." The story running around the office is that *Scrnsave* disables some internal protection for the monitor. My first reaction to reports of this kind is not to take them at face value but rather to try and get some facts. Thus I'm writing to you for enlightenment. Are you aware of any problems of this sort?

One other item of information that may be of value here is that the person who had the monitor burn-up was using an IBM monochrome monitor with a Hercules graphics board. As for me, I'm using a color monitor and a color/graphics board both at work and at home. Any information you can provide will be appreciated.

Ron Cambio

A: We called Hercules to see whether they were aware of the situation you described. They said there was a public domain program blanking the screen circulating on the bulletin boards that had some problems when used in conjunction with the Hercules board; and, in fact, it had been known to burn up monitors. If you use the program in text mode, all's well; but when you switch to graphics mode, the display mode-control port's write-only register is read and the controlling parameters aren't present. When this happens, you'll have problems. The solution is for the program to read a memory image of the register rather than the register itself, and Hercules promised to send a program that did just this.

Meanwhile we talked to Socha. He checked his *Scrnsave* program and claimed that it did, in fact, read a memory image and so should be safe with the Hercules card. However, he wrote the program to work with IBM equipment and suggests that if you are using a Hercules adapter, you exercise caution and wait for their solution.

The Hercules *Scrnsave* program arrived the same day as a Federal Express letter from Hercules. It said, "Red Alert, STOP, Hold Everything. Wait. I sent you a copy of the *Scrnsave* program I promised. When I received the program, I tried it out in the graphics mode on the Hercules card with HBasic. It checked out fine; no problem when the screen was taken down in the graphics mode.

"Today our engineer took a look at the program and told me that it wouldn't work with *1-2-3* in graphics mode, and sure enough, when the screen went blank after three minutes, the offensive symptom occurred. If I hadn't been there to shut off the machine, the monitor might have been damaged. So don't use the program. Van, the man who designed the Hercules Graphics Card, is at work on a program that will do this right once and for all. . . ."

So to be perfectly safe, if you are using the Hercules card, don't use *Scrnsave* in graphics mode. You'll want to contact Hercules to get their solution.

Q: I'm a little peeved by a rather flippant remark in the January 1984 "Q&A," in response to Idio Video and Tabs in Shabs's letter. The remark asserted that IBM's policy actually prohibits their software authors from supporting their products.

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may not have given you an answer to this person's problem.

The gentleman's second problem appears to be his Pascal print routine. ASCII hex 09 is a tab to both monitor and printer. If there have been no tabs set in the printer, an ASCII 09 will simply be passed through as a single, unprintable character.

Daniel A. Johnson

A: Although we do occasionally make flippant remarks, the statement about IBM's software authors being unable to support their products wasn't one of these. We had contacted IBM for their comments, and they said, "Once IBM has contracted with third-party software developers to market a program under the IBM logo, it becomes IBM's product and is supported by IBM only."

IBM supports its PC software through authorized dealers, through its Product Centers, and through its National Accounts and Marketing Divisions or branch offices.

Q: I have *Scrnsave* installed in the Autoexec.bat file of an XT's root directory. When in the 3270 emulation mode of *IRMA*, *Scrnsave* ignores all keystrokes and makes the screen go blank every three minutes. The program functions properly in all but this instance. Please let me know of a way to fix this problem.

Richard Roberts

A: Some programs (*IRMA* seems to be one) by-pass the regular keyboard input routines. Because they interpret keyboard input in a manner different from what *Scrnsave* expects, *Scrnsave* can't detect keypresses. Socha promises to publish a fix to make *Scrnsave* work with programs such as these.

Q: I have enjoyed your column for some time. I never thought I would need to ask your help, but frankly you're my last resort. My tale of woe goes as follows: I have a large (750-line), custom-built Basic program, which I compiled using the IBM Basic Compiler. I have a fully operational, executable copy of the program, but during a recent move the shippers lost both the hard-copy printout of the Basic code and the disk containing the Basic object file.

Is there any software available that would allow me to obtain a Basic object file or a printout from the compiled executable file? I've already called Microsoft, and they have no ideas. Any help would be appreciated.

Thomas Gehring

A: Unfortunately, we can't help, and we feel even worse because we're your last resort. What you need is a decompiler, and we know of none available for micros. If any reader knows of one for IBM's compiled Basic, let us know, and we'll pass the information on.

Q: If I have two files, Wp.bat and Wp.exe, in the same directory, is there any way to ensure that DOS will always read and execute Wp.bat before Wp.exe? Both are called by simply entering *wp*, with no extension, at the command line. No matter in what order I arrange them, when I enter *wp*, DOS always goes to Wp.exe first.

I'm trying to make a batch file (Wp.bat) that will perform some preliminary setup and then call Wp.exe for IBM's *Word Proof*. The program reads the DOS default drive and then adopts it as its own current drive. This means extra keystrokes whenever a data file is called, because the data files are always on another drive; it also means that I can't edit data files directly, because the program only lets you directly edit files on the current drive.

If I change the default drive before calling *Word Proof*, the current drive will be correct; but extra keystrokes are required to change the default drive and call *Word Proof* from a different drive. I'd like the batch file to do all

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this extra work so I can call *Word Proof* by entering *wp* as before. Of course, if I name the batch file differently, it works, but I'd rather use WP.

Bill Kraengel, Jr.

A: Our solution is so simple that you're going to kick yourself for not thinking of it. If you don't want to rename the batch file, why not rename the program file? Use the DOS *rename* command:

```
RENAME WP.EXE PROOF.EXE
```

Now you should be able to use Wp.bat, save thousands of keystrokes, and never interfere with *Word Proof*.

Q: I have two questions concerning my PC. First, how do I get rid of line 25 of my BasicA display without buying the graphics adapter card? I'm strictly using the monochrome display. Second, if I ever get the graphics adapter card, how can a BasicA program check to see whether the card is in the machine?

James H. Sylvester

A: You can eliminate line 25 of your BasicA display on your monochrome monitor the same way you would if you were using a color adapter and display. Just add the statement

```
KEY OFF
```

to your BasicA program and line 25 will disappear. To check to see whether your machine has a graphics adapter card, you need to look at the equipment-determination byte, located at address 410H. To do this, put these two statements into your program:

```
DEF SEG = 0
PRINT PEEK(&H410 AND &H30)
```

If the value returned is a 1, you have a monochrome monitor installed; if the value returned is a 0, the program found a graphics adapter card installed. You *and* the value at this location with 30H to isolate the two bytes that specify the display.

Q: Dan Rollins's article on Basic's undocumented commands (January 1984) was excellent. His presentation of the uses of the environment command was better than some I've seen in articles supposedly concentrating on DOS 2.0 features.

Though these features work for interpreted Basic 2.0, they do not seem to function in IBM's compiled Basic. Indeed, compiled Basic doesn't support any of the improvements in DOS 2.0. That IBM continues to sell an expensive compiler incompatible with the features in the operating system seems a bit shabby. Which of the several available Basic compilers really support the DOS 2.0 features?

James B. Nickson

A: We aren't familiar with any Basic compilers other than the IBM compiler, but we do know that IBM plans to release a new version of its compiler that will support all the DOS 2.0 features, including such undocumented commands as the infamous *shell*.

Q: I've been using Supersoft Fortran on the PC under DOS 1.1 and would like to build a library of .obj files to be accessed in much the same way as the standard Fortran library routines. A library builder program compatible with the DOS Link program is available from Microsoft, but not in a version that runs on the PC.

I've tried several times to get information from IBM about this program, but with no luck. The program, called *Lib*, takes .obj files and combines them into a lib-type file for use by the linker. It is generally distributed with Microsoft DOS—but not with IBM DOS.

I've also spoken with Supersoft, but they say they aren't licensed to distribute this program. There must be some way to get this program or a similar one for the PC.

Additionally, I recently got an error from Link that stated my program was too large for it to handle. It isn't too large to run (the .exe file is about 75K), so I guess Link has some internal limitations. Perhaps a better link program exists. If you know of one, please let me know.

Finally, you might be interested to know that the *Quadrive* RAM disk program from Quadram is incompatible with the *Scrollk* program published in *Softalk*. If *Scrollk* has been run before one issues the *QD* command, the system crashes and must be turned off to recover.

Thomas C. Russell

A: We talked to Microsoft about their *Lib* program, and they reconfirmed that it's not sold separately. It's part of their compiler group, and they do include it with each of the language compilers they sell. Our suggestion is that you purchase the IBM/Microsoft *Macro Assembler*. It has many uses for sophisticated programmers, and the *Lib* program is included with it.

Your Link error message means that you ran out of symbol space, not code space. If you use fewer public symbols, you may be able to reduce your symbol space size and proceed with your current linker. Microsoft also has a new linker available with expanded capabilities. It's sold with the new versions of their languages, such as the IBM Pascal released this spring. ▲

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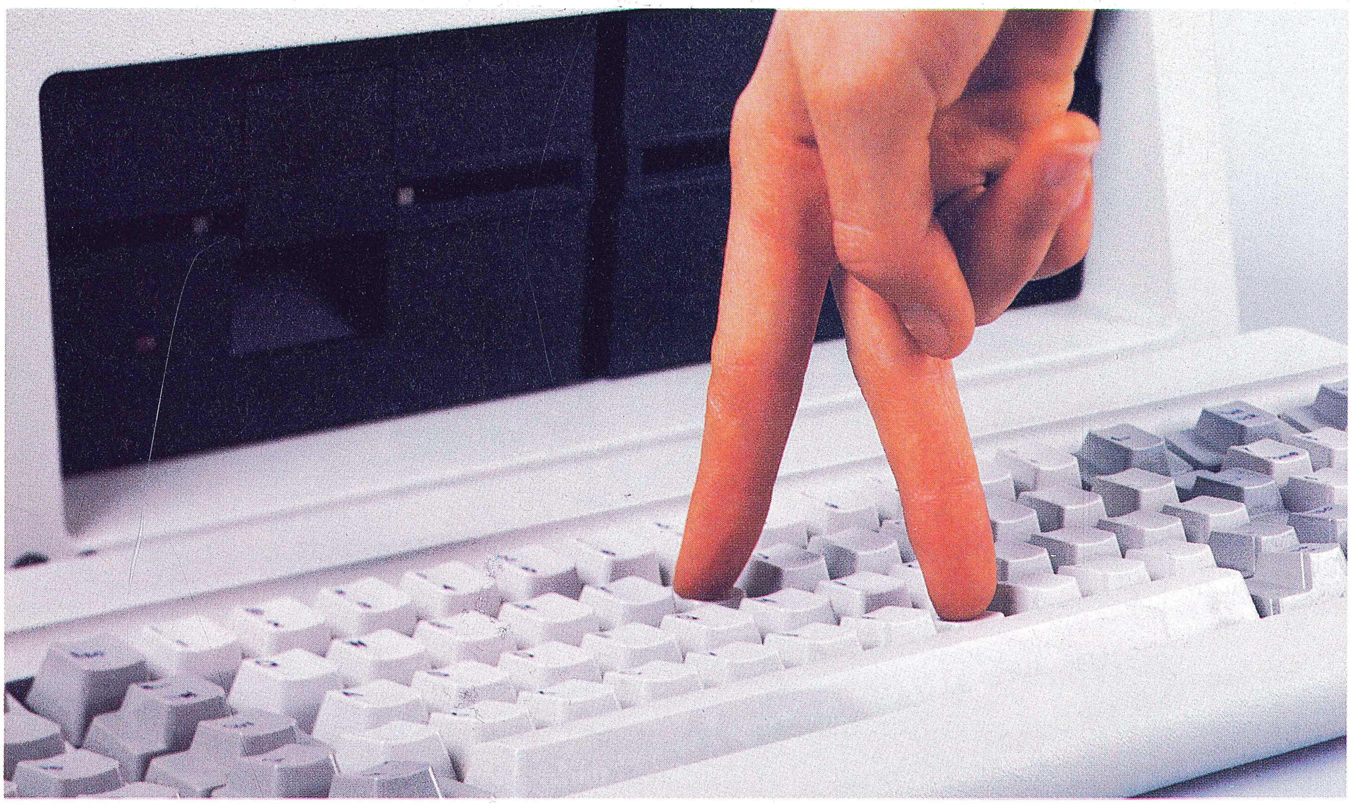

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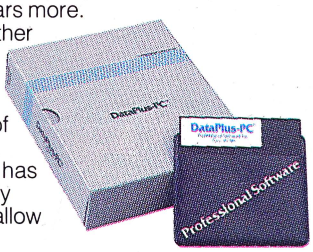

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VisiOn: Enough Functionality To Sink a Ship?

By Thomas Bonoma

Images compete and collide. . . .

Simple user interface but enough menus and options to make *WordStar* look like a two-choice discrimination task.

Integration that hasn't been approached before on the XT but implementation that's frustrating as often as it's synergistic.

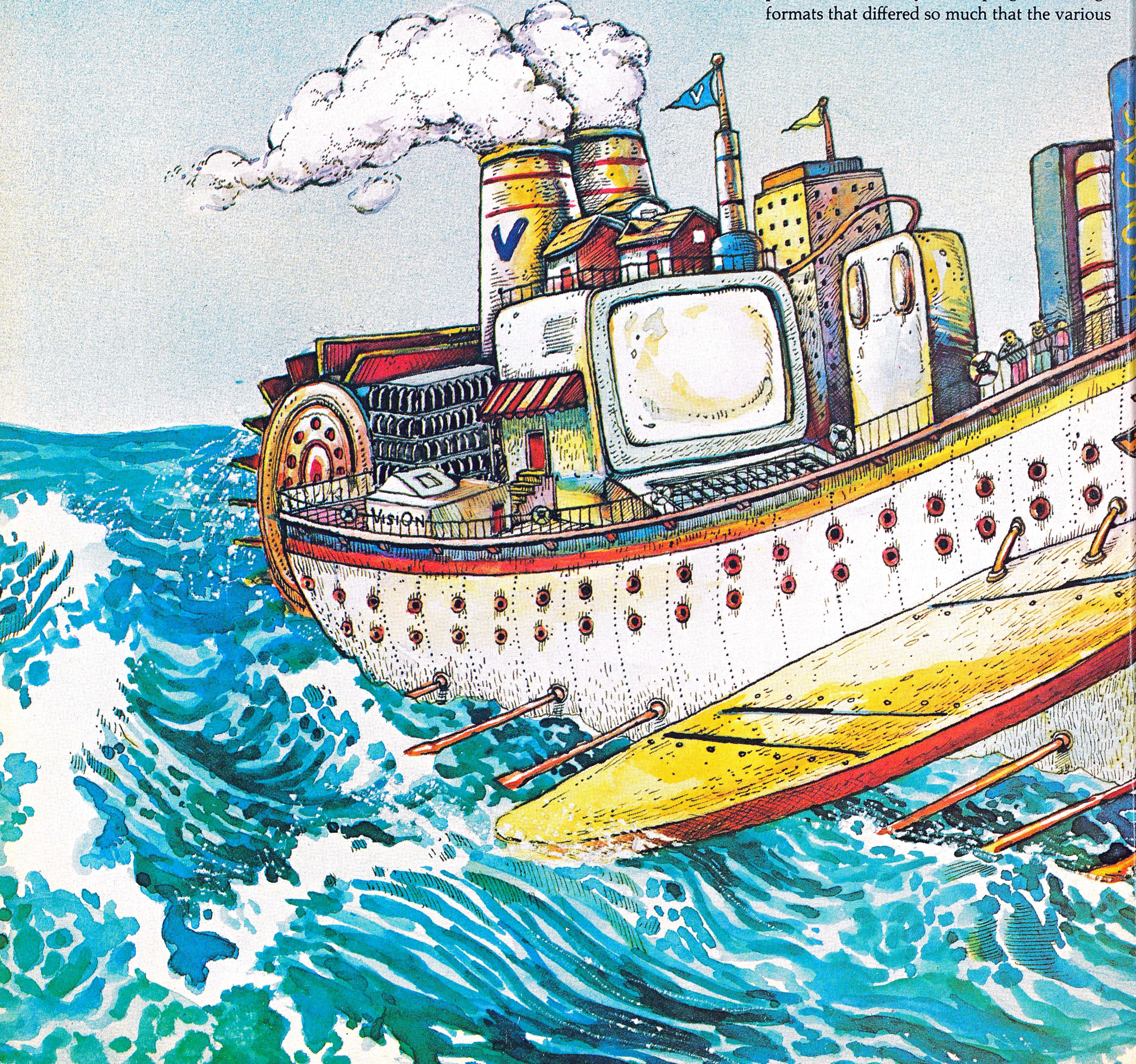
Hard disk requirement and the consequent promise of lightning speed, delivery (often) of sluggish, choking, maddening, "please wait" operation.

Best and perhaps worst, a clear "vision" of the future that greatly outstrips the hardware for which it was created and that imposes a not altogether welcome rigor on the user even while freeing him from problems raised by other systems. To understand *VisiOn* is to understand first this vision.

The Vision of *VisiOn*

VisiOn was conceived in 1982 as the answer to knowledge workers' need for complete functional integration—integration between user, screen, storage, and computation. (A knowledge worker is one whose primary occupation is the manipulation of words, concepts, and pictures in an effort to reinterpret reality in some manner. A manager would be one example of a knowledge worker; a staff analyst in a corporation would be a better example.)

Software in 1982 was in a state of disarray when it came to doing "real work." There were acceptable word processors, database managers, graphics packages, and spreadsheets, but the poor user who employed one each of these had to contend with commands that were implemented differently in each program, storage formats that differed so much that the various



programs communicated with one another awkwardly at best, applications restrictions that meant that only one program could be run at a time, and a general hostility of documentation and code that made computing more suited to hackers than to managers. *VisiOn* was intended to redress these problems.

Judging from the state of software in early 1984, the problems of 1982 remain; a sound fix would still be welcome.

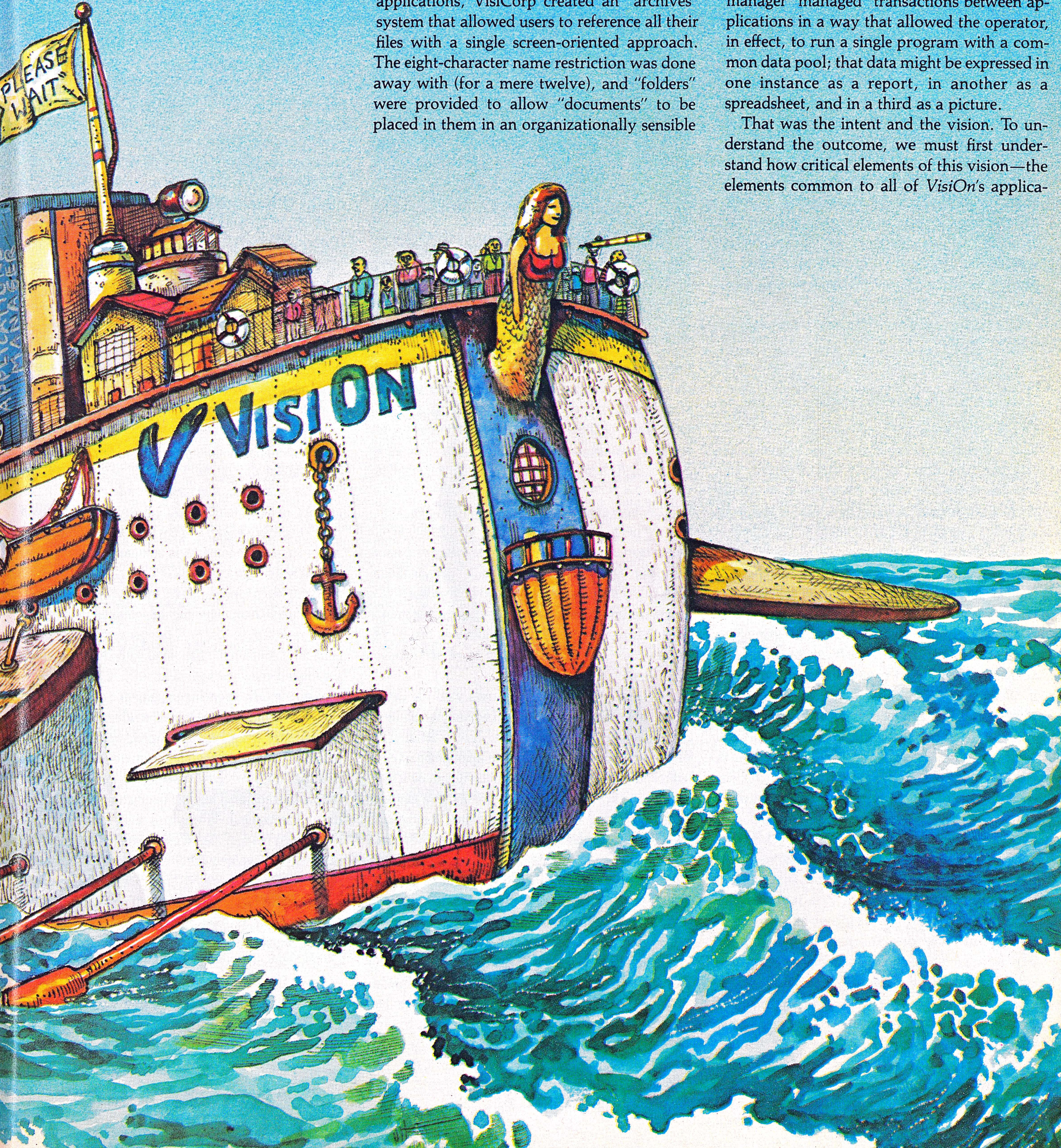
To address the need for command consistency and a good user interface, VisiCorp designed *VisiOn* to be consistent in its menu, file, and documentation structure across all its applications. It was even to be "underlaid" by an applications manager that would do most of the system's dirty work—such as management of peripherals, screen interface, and filing.

To reconcile the conflicting filing requirements and storage formats of the individual applications, VisiCorp created an "archives" system that allowed users to reference all their files with a single screen-oriented approach. The eight-character name restriction was done away with (for a mere twelve), and "folders" were provided to allow "documents" to be placed in them in an organizationally sensible manner—without regard for whether they contained words, numbers, or pictures.

To overcome the one-application-at-a-time limitation, VisiCorp made its most important innovation: a screen on which several applications—even several documents created via the same application program—could coexist happily and operate with (intended) concurrency.

Finally, to handle the difficulties of data communication and transfer, the applications manager "managed" transactions between applications in a way that allowed the operator, in effect, to run a single program with a common data pool; that data might be expressed in one instance as a report, in another as a spreadsheet, and in a third as a picture.

That was the intent and the vision. To understand the outcome, we must first understand how critical elements of this vision—the elements common to all of *VisiOn*'s applica-



tions—were implemented; then we can consider the applications themselves.

The *VisiOn* System

As received for review, the *VisiOn* system consists of:

- An optical mouse and RS-232 cable;
- A nontechnical book introducing the philosophy and general nature of the system;
- The Applications Manager, which is the heart of *VisiOn;*
- *VisiOn Calc*, a spreadsheet program;
- *VisiOn Graph*, a graphics program;
- *VisiOn Word*, a word processing program.

Another program, *VisiOn Query*, is due for release shortly but wasn't available for this review.

VisiOn requires an IBM XT with color/graphics adapter and 512K. If you want hard copy, you'll need a graphics printer (for graphics and word output) and/or a plotter (for graphics output). In return for this major investment in hardware and software, VisiCorp promises to provide for all your serious computing needs.

Now that we know the theory, let's have a look at reality.

The Applications Manager

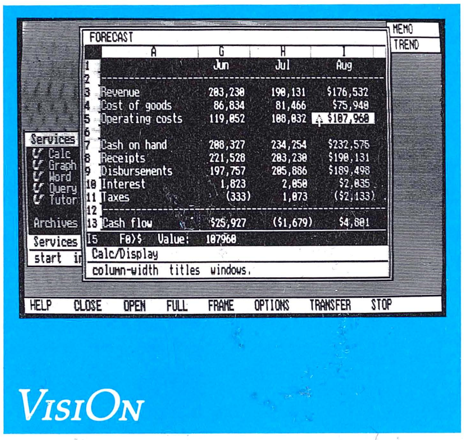
When you boot *VisiOn*, you must have a special "key diskette" in your floppy drive; this lets the software verify that you're working with a legitimate copy. Then you must wait while the system calibrates your optical mouse. Then you may proceed.

The first thing you see after loading the system is the Applications Manager's "services window," a rectangle divided into three parts horizontally (actually, the *very* first thing you see is "please wait," a portent of things to come). The bulk of this rectangle, or window, is taken up by the Applications Manager's display; a second line serves as a prompt area, and a third shows the options available in this window. The services window allows you to install or remove applications, configure peripherals, manage the print spooler, examine archive files, specify drives for storage, and start applications.

VisiOn's basic display unit is a window, a flexible rectangular space you can adjust in almost any manner you wish. Windows can not only butt against other windows but also overlay or underlay one another. In general you can arrange your screen layout—the number of windows present as well as their sizes and positions—in any way you find congenial. At any given time, one window is considered to be current, or active.

The Applications Manager handles screen windowing through four of its eight basic commands. *Frame* lets you specify a rectangular area for the current window to occupy. *Close* removes the window display from the screen and stacks the still-present window in the upper right corner for easy recovery. *Open* reopens a closed window, recalling it to its former frame position. And *full* causes a selected window to take up the entire screen.

Other Applications Manager commands handle an integrated *help* function for the entire system, deal with various *options* available in different windows and in different application functions, manage the *transfer* of data between applications, and allow you to *stop* a command in progress in any application. Each of the Applications Manager's commands is available not only at system bootup but during the operation of any application as well.



```
FORECAST
                          G          H          I
                         Jun        Jul        Aug
 1
 2 ---------------------------------------------------
 3 Revenue             203,230    190,131   $176,532
 4 Cost of goods        86,834     81,466    $75,940
 5 Operating costs     119,052    108,032   $107,960
 6
 7 Cash on hand        208,327    234,254   $232,575
 8 Receipts            221,528    203,230   $190,131
 9 Disbursements       197,757    205,886   $189,498
10 Interest              1,823      2,050     $2,835
11 Taxes                 (333)      1,073    ($2,133)
12 ---------------------------------------------------
13 Cash flow           $25,927   ($1,679)     $4,801
I5    F0)$  Value:  107960
Calc/Display
column-width  titles  windows.
```

The *help* feature is one of *VisiOn*'s best. When help is called, a *help* window (what else?) appears on top of the current application window; you can then point to the problem area in your application window, and *help* will bring up customized context-specific information. Moreover, the *help* window is cross-referenced so that you can jump to related topics with ease.

The *options* command shows various menu selections on still another window; its content depends on the application from which it's called and the submenu in the application from which it's called. In the services window itself, calling *options* allows you to set the default window size, designate whether keyboard control of menus is to be permitted or not, and specify whether or not the system is to beep if you select an illegal option. In *VisiOn Graph*, if you call *options* from the main menu, you get a window that lets you change axis parameters, display formats, and so on for the current graph; however, if you call it from the *print graphs* display, you're asked on what device the graph is to be printed, whether the page should be laid out as a single graph, as a pair of graphs (arranged horizontally or vertically), or in quadrants. All this sounds complicated, but in practice it's not.

Finally, the *transfer* command allows data to be moved between the various *VisiOn* applications. While you might assume that in a closed system such as *VisiOn* data is fully transferable from one application to another, this isn't quite the case. Some transfers are prohibited. Graphs, for instance, cannot be moved into the word processing program, so truly integrated text-and-graphics reports cannot be produced automatically. And some transfer operations sacrifice essential data characteristics; for instance, when percentage data are copied from *VisiOn Calc* to *VisiOn Graph*, the graph program gets the numbers but doesn't know that the data were percentages. Generally speaking, numbers transfer and formats do not.

Although there are some restrictions on the *transfer* command, data transfer among *VisiOn* applications is, for the most part, a miracle of ease. You simply point with the mouse to the area of the spreadsheet, report, or whatever it is you want to move, and the transfer is managed automatically. It is even possible, for example, to point to a rectangular range of numbers on a spreadsheet, then point to the graphics screen, and have a bar chart appear. Pure black magic!

Unfortunately, there's no provision for exporting or importing files to or from ASCII. You can't even convert a *VisiOn* file to VisiCorp's own DIF format (the documentation suggests that VisiCorp expects the makers of application programs to adapt their software for this purpose). Only a special set of utilities allows *VisiOn Calc* and *Graph* to import files from the non-*VisiOn VisiCalc* and *VisiTrend/Plot*. In short, *VisiOn* is a nearly completely closed software system.

Archives Management. *VisiOn* has the most useful and thorough file management system implemented to date. The user starts with a general "archives" file into which any data generated may be saved at will. The program also allows the creation of a more complicated filing scheme, consisting of folders into which documents may be organized. Files are identified by name, date of creation or revision, whether or not they've been saved since last manipulated, and length (documents are catalogued in pages). Filenames may have a comment appended as well. The system also maintains a wastebasket folder to preserve the most recently overwritten or deleted file.

The net effect of this archiving system is that no matter what application you may be using, you're confronted with exactly the same file screen and only the files relevant to that application. The system allows data backup, copying of documents from one file to another, and a host of other functions. It is, of course, possible to keep a file-archiving window on-screen while you work within any application window.

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Peripherals Management. Yet another activity of the Applications Manager is to install, hold drivers for, and run any peripherals on the system. *VisiOn* currently supports only a narrow range of printers and plotters and will disappoint any user with even mildly esoteric equipment (such as an IDS Prism or a Diablo 630). All requests for peripherals are spooled, so it's legitimate to submit requests for the printing of a document, three graphs, and something else, all at the same time. A disadvantage of this approach is that the services window has to remain on-screen or must be pulled up periodically, in order that you may answer program commands such as "put in paper now."

The Mouse Interface. The Applications Manager also manages the optical mouse and the windowed screen.

The mouse is integral to *VisiOn*'s operation. Working with the keyboard for menu commands in most cases requires an escape (or escape-shift) sequence and is awkward at best. The mouse allows simple pointing and clicking. Except in one instance, the PC function keys are not used at all.

This mouse-dependent philosophy is carried through all functions of all *VisiOn* applications. Screen scrolling, for instance, is a matter of holding down the right mouse button and moving the mouse in the direction one wants the screen to scroll. The farther the mouse is moved, the faster the scrolling. Especially character-dependent programs, such as *Word*, of course, still allow traditional Home- and End-type character key moves. Nonetheless, the mouse is everything to the *VisiOn* user.

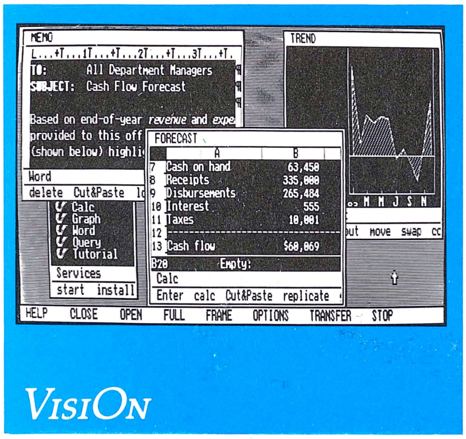
Whether that suits you well will depend on your taste and, perhaps, your typing proficiency. For some who are less than virtuoso typists, mouse operation may be a godsend. For others, a mouse may just get in the way. Generally, the more sophisticated the user the less utility the mouse has.

The Menu System. On any given screen there are two main menu lines and the possibility of a "subwindow" containing additional menu choices. The *Word* screen, for example, shows seventeen primary options on the bottom two lines; the subwindow offers roughly thirty-five additional choices (and *Word* is one of the simpler applications). As mentioned before, menus are keyboard-callable as well as mouse-invokable, but it's clear that the system is designed to encourage the use of the mouse.

VisiOn in Operation

With all this functionality underlying every application, you might suspect that *VisiOn* would be a little slow in operation. It is and it isn't. It's slow in some cases and deadly slow in others.

In some applications (say, in *Word* or *Graph* when only one window is in use), the program is on the low side of acceptability in speed, but it's adequate nevertheless. In other applications—*Calc*, for example, especially when a number of windows are in use, or at times when the Applications Manager is busy with print spooling—*VisiOn* is in the totally unacceptable, throw-it-out-the-window speed range. Sadly, when used as intended, with multiple windows, print spooling, and the like, the system is not quick enough even for hunt-and-peck managers, and it leaves the user feeling that the software inhibits rather than fosters integration.



```
TO:        All Department Managers
SUBJECT:   Cash Flow Forecast

Based on end-of-year revenue and expe
provided to this off
(shown below) highli
```

```
       A                        B
7  Cash on hand            63,450
8  Receipts               335,000
9  Disbursements          265,484
10 Interest                   555
11 Taxes                   10,001
12 ------------------------------
13 Cash flow              $60,069
B20          Empty:
```

MEMO
L....+T....1T....+T....2T....+T....3T....+T.
TREND
M M J S N
FORECAST
Word
delete Cut&Paste
Calc
Graph
Word
Query
Tutorial
Services
start install
Calc
Enter calc Cut&Paste replicate
out move swap
HELP CLOSE OPEN FULL FRAME OPTIONS TRANSFER STOP
VisiOn

Moreover, the use of the mouse for everything imaginable means that user sophistication will in large measure determine satisfaction with the system. Even fair typists will likely become impatient with *VisiOn*'s leave the keyboard, hit a mouse selection, wait, hit a confirmation, wait, wait, choose "done," wait, move back to the keyboard, nope, choose another selection, wait, et cetera style. In fact, even "unfair" typists may tire of this sequence. The option to enter commands at the keyboard instead of via the mouse is not much help on this score. What's going on is that the program is constantly running out to disk for one thing or another; these disk calls cause delays ranging from half a second to five seconds, and their net effect is to make you wait no matter how you've entered your command.

Finally, the windowing scheme itself, with its complex management requirements, overlay abilities, and clever graphics, may or may not be worth the consequent slowness of operation. For many users, the key to integration is not the availability of all applications at all times and in as many replications as desired; it is, rather, the ability to transfer data—something that *VisiOn* does adequately. If the necessary tradeoff for overlay ability is speed, there may be many managers who will prefer a less flexible but less taxing approach.

Having said all of this, we've now completed only an overview of the most important but least visible aspect of the system, the Applications Manager. Let's look now at each of the *VisiOn* applications—*Calc*, *Graph*, and *Word*.

VisiOn Calc

VisiOn Calc is an extraordinarily capable spreadsheet. Some of its more interesting features are labels with typeover (extension of labels into adjacent empty cells), named ranges, and label lookup; a standard deviation function and two random number functions (uniform random and random around a mean); table lookup; a set of financial functions, including financial management rate of return, future value, internal rate of return, net present value, and payment calculations; and a set of calendar functions. In addition to these capabilities, the worksheet supports windowing, ascending and descending sorts of values, a number of display and editing options, and improved replication.

The *Calc* "attributes" menu function, for example, is a genius of flexibility. Values and labels may be aligned separately flush left, flush right, or centered; percent signs or dollar signs (trailing or preceding, fixed or floating) may be appended to values. The submenu also has provisions for setting tab stops and restricting the contents of specified ranges to numbers, labels, anything, or nothing. Values can be shown as numbers or as formulas. Cell contents may be made invisible and/or write-protected. Most interesting, perhaps, there's a facility for setting upper and/or lower boundaries on cell values.

In operation, even with recalculation turned off, *Calc* is slow. In fact, it is the slowest of the *VisiOn* applications. Everything from screen scrolling to responses to the *enter* command to marking ranges happens slowly enough that one is continually on the border of frustration, especially if one has had any experience with *1-2-3*. There is just no snap to *Calc*'s operation, and the delays get harder and harder to tolerate the more sophisticated a user becomes.

VisiOn Graph

VisiOn Graph is a clever and capable presentation graphics generator that, like the rest of the *VisiOn* system, incorporates a strong design philosophy that will either alienate users or please them immensely. The philosophy is that all data are best construed as time-series data. The program will handle non-time-series data sets, but that's not what it was designed to do. (Time-series data are data that have units of time—years, quarters, months, weeks, or days—as one major axis of variation. Thus, data on sales by year in a corporate division are time-series data; golf scores by player are not.)

Graph has three main screens and a main menu that presents ten options. The screens are the graph screen, on which graphs are

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drawn; the edit screen, on which data are entered, displayed, and manipulated; and the hard-copy screen, on which graphs are composed exactly as they'll appear on paper. The general flow of events is that the user enters (or transfers) data to either the edit screen or the graph screen, and a picture is composed therefrom.

The main menu items include a *data* command, which allows you to specify which of many possible existing data series you want to appear in the current graph or which graph files you want to use. A *style* command chooses one of the program's six graph types, which include line graphs, bars (comparative and stacked), pie charts, x-y graphs, area charts, and hi-lo-close charts.

The *plot* command puts a set of data series on the screen according to what has been selected in *style*, while an *annotate* function allows titles to be placed on the graph in either of two fonts (roman and bold). The *annotate* command functions further as a rudimentary free-text editor and placer of text on the generated graph; text may be positioned horizontally or vertically and then moved, deleted, or replaced.

The *edit* command brings up the edit screen and allows you to define, replace, or print data series. A *fill* command allows the construction of series by interpolation between values or by arithmetic or geometric rules. The *print* command permits placement of one, two (vertical or horizontal), or four graphs on the hard-copy screen for previewing purposes; allows even more titles to be added to the sheet; and manages the printing of the graph or graphs by sending the hard-copy sheet to the Applications Manager. The remaining commands erase the graphics screen, rescale and manage the display of the graphics axes, access the filing system, and quit the window or application.

Graph also has limited but nevertheless useful text-charting abilities. Unfortunately, the characters generated aren't quite big enough for use as overhead transparencies, but they could do in a presentational pinch.

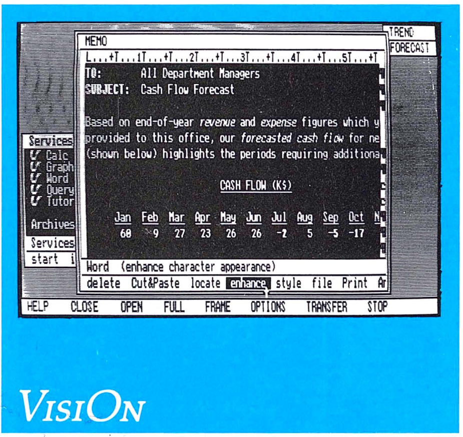
In operation, *VisiOn Graph* suffers less from slowness than does its companion application, *Calc*. No one would call the program lightning fast, but it functions acceptably and without error. It's an impressive piece of programming.

VISION WORD

VisiOn Word is in many ways the star of the system. Like *Calc* and *Graph*, it makes good use of the mouse, filing scheme, and other attributes underlying its operation, and it also offers good keyboard control along with a menu of nine options that can be chosen via the mouse.

The *delete* command, the first main menu option, allows you to erase by word, to the end of the line, by sentence, or by paragraph. You select the command, then either mark a range on the document by highlighting or choose one of the object operators, then indicate which sentence (or whatever) is to be removed. The program has thoughtfully included an undelete function as well.

The *cut & paste* command features a potpourri of suboptions to move text around on the document sheet. Among these are *replace* (global, once, or confirmed global), *copy*, *move*, *extract*, and *include*. *Extract* and *include* let you send a range of the current document text to the archives or retrieve something from the archives for inclusion in the current document.



TO: All Department Managers
SUBJECT: Cash Flow Forecast

Based on end-of-year *revenue* and *expense* figures which y
provided to this office, our *forecasted cash flow* for ne
(shown below) highlights the periods requiring additiona

CASH FLOW (K$)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	N
60	9	27	23	26	26	-2	5	-5	-17	

Word (enhance character appearance)
delete Cut&Paste locate enhance style file Print Ar

Locate handles searches as well as cursor moves. *Enhance* uses the "object operators" as in *delete* to allow boldfacing, underlining, or italicization. The Options Sheet offers additional print enhancements: superscripts, subscripts, and overstriking. *VisiOn Word* shows enhancements on-screen as they will be printed; there are no control characters or indicators in the text. *Style* deals with format ruler changes, line-spacing changes, indentation of text, and centering.

Print allows the inclusion of "captions" with the text and manages the appearance of runtime messages. "Captions" is *VisiOn Word*'s term for headers and footers. Up to three lines of headers and footers may be specified, with or without automatic dating and pagination.

Finally, there's the interesting *analyze* command, which currently has only one subchoice—*synopsis*. *Synopsis* is a screen that maintains the following information for a given document: author, date of creation, date of revision, date last printed, a comment line, and line and page counts. Undoubtedly, the *analyze* command will be enhanced at some time with a spelling checker and other utilities.

There are three general ways in which *Word* falls short as a consequence of its being a part of the *VisiOn* system rather than a standalone word processor. First, almost a third of its

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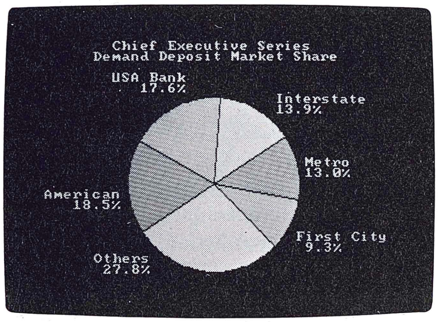

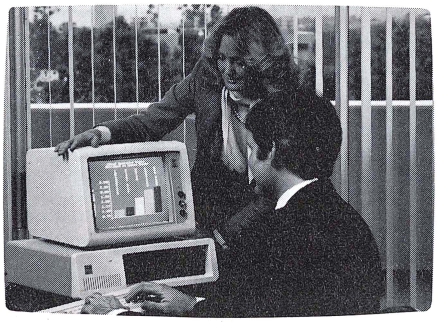

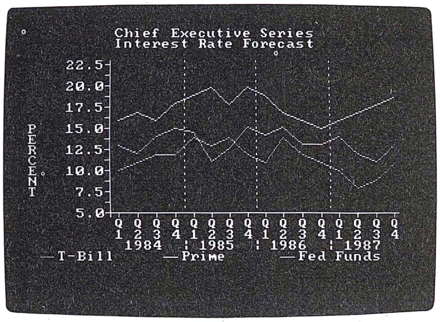

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screen is consumed by a variety of control information. The top of the screen contains a format ruler and documentation of program functions, cursor location, text enhancement status, and document name; at the side are two control bars that show paragraph endings and "caption" placement; and at the bottom are three lines that contain the *Word* and Applications Manager menus. All this means that only twelve lines of text are left visible to the user.

Second, the requirement that the user either type an escape-key sequence or leave the keyboard to manipulate the mouse means that weak typists will stay that way and good ones will be frustrated. It's hard to become "expert" at *VisiOn Word*. The boon of the system becomes, with experience, its bane. Simple function-key access to major commands would remedy this.

Third, *Word*, like its siblings, has an annoying tendency to go to disk for up to five seconds at a time for various things (it's less maddening than *Calc* in this respect but worse than *Graph*). These "various things" include loading a program component (when *print* is selected, for example), saving text that has been typed in or is being adjusted in some manner (the program does on-screen justification, and this seems to necessitate lots of disk work), and scrolling. The waits are sometimes long enough to make one wonder whether the program has crashed. Often a pause or disk access will occur at the end of a line of text entry, meaning that the user can easily overrun the XT's keyboard buffer while waiting for *Word* to return.

Furthermore, the program lacks a certain functionality that a professional writer might demand. There is no provision, for example, for mail-merge, footnotes, spelling checking, automatic figure numbering, or insertion of graphics.

Nevertheless, what *Word* does it does well; it works perhaps the best of the three applications reviewed.

Other Features of *VisiOn*

VisiOn's documentation is superb. Each manual is set up in the same manner. There's a "Quick Start Guide" designed to get you up and running, a reference manual organized by program function, a section of examples that shows actual files as they're created, a section that explains messages from the system, a good glossary, and a good index. The writing is lucid, engaging, and useful.

The on-screen tutorial provided with the system is even better than the printed material. In its own way, this tutorial is an "application" that a user can run at any time to refresh his memory about system functions.

Two other aspects of the *VisiOn* system deserve mention: ease of installation and memory management limitations.

To install the software, all the operator or dealer needs to figure out is how to install the Applications Manager. That program then automatically manages the installation of any and all current or future applications. The Applications Manager itself is supplied on four diskettes: two program disks for the Applications Manager itself, an Accessories disk (having to do mostly with peripherals), and the Key disk that allows the software installed on the hard disk to function. Each application itself is supplied on two disks, and installation of these is marvelously easy and nearly automatic.

When running the *VisiOn* system with multiple windows (two or three only), even on an XT configured as specified in the manual, the system frequently runs out of memory. When this happens, the program advises the user to "quit some windows"; this message even comes up during print spooling when only a single window is in use. Clearly, the software is pushing the limits of a 512K machine.

The Bottom Line

If you're a manager who is not familiar with personal computers in general or with current software such as *1-2-3*, *dBase II*, and the like, *and* if you're not a very good typist, you may find the *VisiOn* system more than adequate for your needs. If, however, you're a moderately good typist and have had at least rudimentary experience with the aforementioned programs, you're not likely to be satisfied with the speed at which this system is able to execute your ideas.

If you're a knowledge worker who does mostly number and graphics manipulations, you also may find *VisiOn* too slow for most of what you want to do, especially if you need to create and work with moderately large spreadsheets. And if you're a hobbyist, you may not need the power of this system.

In short, the more experienced you are, the more you're likely to expect of your hardware-software combination and the less likely it is that you'll be willing to accept *VisiOn*'s sluggishness and enforced novice menu presence in return for the integration provided.

In summary, the *VisiOn* system is a milestone in personal computer software. Like many other milestones, it both points the way toward the future and falls far short of it. ▲

Prices for *VisiOn* are as follows:

Applications Manager	$395
Mouse	$250
VisiOn Calc	$395
VisiOn Word	$375
VisiOn Graph	$250

READ ONLY

A review of the IBM Personal Computer family. Summer 1984

UP AND RUNNING

And Swimming, Building, and Baking. Building and baking? They don't produce gold medal winners, but they do figure in staging the Olympic games. So do 200 IBM Personal Computers (including software) that are part of IBM's sponsorship of the 1984 Olympics in Los Angeles. In fact, IBM PCs are hard at work in both sports and administration.

PCs are involved in a wide range of planning and analytical activities, though they don't provide official results of the various athletic events. Some events, for example, use the IBM PC to determine how competitors are seeded—who competes against whom. In other events, such as archery, the PC simplifies the complex task of recording scores and compiling statistics for each athlete as the competition progresses.

In events like gymnastics that depend on points awarded by judges, statistics can be kept on the PCs to analyze scoring consistency. Also, a whole range of information about individual athletes, past Olympics, and world and national records, both past and present, can be quickly recalled and compared with the help of the IBM PC.

Last but not least, administration. Spreadsheet programs, such as IBM's Multiplan™, were used on the PC for planning and forecasting by nearly every administrative department, from Construction to Ticketing. The same departments speed up some of their day-to-day accounting tasks with the help of the PC and IBM accounting packages.

Departments with specific software needs developed special packages with the assistance of a programmer whose services are part of IBM's Olympic sponsorship. Specially designed programs include database management applications to help handle transportation requirements and inventory control programs to keep track of sports equipment and personnel records.

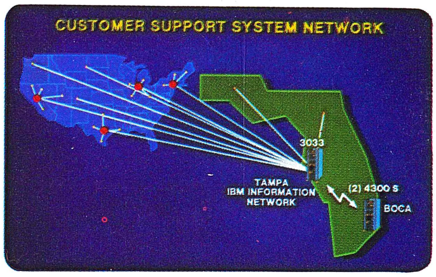
In short, there's hardly an area of planning and staging the 1984 Summer Olympics that the IBM Personal Computer doesn't play a part in. Maybe there *should* be medals for administration.

Multiplan is a U.S. trademark of Microsoft Corporation.

ON THE STOREFRONT

A Shorter Distance between PC Points. We're all familiar with the feeling of being lost in the growing maze of new computer products. IBM has opened a path through that maze, straight to the information and answers you need about IBM Personal Computer Products—information about a specific software package or hardware configuration and answers to technical questions.

The key to entering this new information path is the IBM Customer Support System (CSS) at your authorized IBM Personal Computer retail dealer or IBM Product Center. Dealers in over 300 cities throughout all 50 states use the Customer Support System, which includes a nationwide communications network, to help give you instantaneous computer-age service support that's unmatched by any other computer manufacturer.



Colorful Stops along the Way. More than 1,700 authorized IBM dealers have access to a permanent and continually updated directory of IBM Personal Computer product information in IBM's Customer Support System. For a sharp color display of the type and level of information you want, visit your dealer or IBM Product Center and choose from lists of options displayed on an IBM PC color monitor. There are choices that guide you quickly and easily from product directories to in-depth product demonstrations and configuration information.

Since knowing how to take the first step is often a problem, CSS gives you a variety of possible starting points. By selecting the appropriate category—such as printers or business software—you can move to a list of specific products and then to the

Information from CSS with simple one-key commands

product demonstration you want. If you know a product name to begin with—Word Proof, for example—CSS will make an alphabetic search for it. To keep you up-to-date, there's also a special listing for new product announcements.

You can browse through the CSS displays at your own pace, pausing at a given spot or moving quickly backward or forward by using simple one-key commands that are always displayed at the bottom of the screen. One of these commands enables you to make print-outs of any information you wish to save for future reference.

The IBM PC family's color graphics capabilities make the CSS software demonstrations especially impressive. The Multiplan demonstration, for example, consists of several consecutive screens of information. Each screen is split vertically, with representative sections of the actual program on the left and explanatory text on the right. By the time you've seen the entire demonstration, you'll have a good idea of both *what* the program can do for you and *how* it does it.

Answers at the End of the Line. Over 1,000 authorized IBM retail dealers and IBM Product Centers are linked through their Customer Support System to the IBM Information Network. This nationwide communications capability helps your dealer give you fast, efficient service. Warranty claims, for instance, can be handled through CSS with a minimum of paperwork and delay. Dealers also use the network to communicate with other dealers and with IBM to keep abreast of the latest product and service information.

In addition, the CSS network is your gateway to technical information about the IBM Personal Computer family of products. IBM maintains a database on a 3033 mainframe in Tampa, Florida, that your dealer can use to answer—within minutes—a wide range of questions. If the solution isn't on hand in the database, your question can be submitted through CSS to a technical support staff in Boca Raton. There, it will be analyzed and an answer returned through CSS to your dealer.

The information used to answer your inquiry is added to the CSS database, where it will be immediately available for anyone else with a similar question. Your technical inquiries therefore contribute to the growth of the Customer Support System. Its on-line product information, color graphics displays, and advanced communications all have a single purpose—to help you get the most out of your investment in IBM Personal Computer hardware and software products.

HARDWARE NEWS

Color. There's color news for the IBM PC, IBM PC XT, and IBM *Portable* PC in the form of the IBM Personal Computer Color Printer. It's a high-performance, dot matrix printer that can print charts, graphics, artwork, and text in up to eight colors. The Color Printer produces color graphics that can enhance the appearance of your reports and presentations and make the information they contain even easier to understand. It can also type directly onto overhead transparencies.

The IBM PC Color Printer's range of performance features make it especially well suited for heavy-use/high-productivity applications. A near letter quality printing mode is standard. Printing speeds of up to 200 characters per second can help save time. So can programmable automatic control of print requirements such as print mode, line spacing, and margin and tab setting. These programmable features act as an extension of many software products—word processing programs, for instance—and can be initiated with just a few keystrokes.

A final feature for those who like a personal touch. You can use the Color Printer to personalize your documents by varying the printing modes, character spacing, and boldness. This allows you to differentiate among headlines, subheads, and quotations and even to print math and science equations.

The IBM PC Color Printer

The Big Crunch. Not long ago, computing and number crunching were nearly synonymous. Personal computers and software for everything from office management to agriculture changed that, but the need for heavy number crunching has hardly disappeared. If it's still a part of your computer workload, the IBM Personal Computer 8087 Math Co-processor can help speed up your calculations.

The 8087 is a floating point co-processor that multiplies, divides, adds, subtracts, exponentiates, and performs trigonometric and logarithmic functions. It works together with the PC's 8088 processor to improve the execution speed of floating point operations by as much as 10:1. The Math Co-processor increases calculation speeds so greatly because it makes floating point operations a hardware rather than a software function.

In addition to increasing the speed—and often the level of precision—of statistical and analytical math packages, the Math Co-processor can improve the display speed of graphics and video games. It also significantly improves high-level language execution time, and is designed to work with the APL Interpreter and the version 2.0 Pascal and FORTRAN Compilers discussed next in this issue.

WHAT'S THE PROGRAM

We Speak Your Language. IBM Personal Computers are shameless polyglots. They can handle most of the popular programming languages you want to work with. Much of the credit for their versatility goes to the IBM Disk Operating System (DOS) 2.10. This updated version of DOS 2.00 was developed to provide support for the IBM PCjr as well as for the IBM PC, PC XT, and IBM *Portable* PC. So all members of the IBM Personal Computer family are united by a single master program that provides the required support between their hardware and a wide range of application programs.

More to our present linguistic point, the DOS 2.10 diskette contains two programs, Disk BASIC and Advanced BASIC, to help you write your own programs on an IBM PC. (IBM PCjr BASIC—a separate, optional cartridge—provides this support for the PCjr.) Disk BASIC adds DOS file support, date, time of day, and communications capabilities to the BASIC language that comes with every personal computer from IBM. Advanced BASIC adds advanced key trapping and advanced graphics—including viewports, windows, and paint tiling—plus music and other capabilities.

DOS has other features that help simplify advanced program development and design, including a line editor, a linker, background printing, and chaining of commands. For help with writing and editing particularly sophisticated BASIC programs, there's the BASIC Programming Development System, a software package that consists of two programs and four utilities. The first program includes a Text File Editor and a Structured BASIC Pre-processor; the second includes a BASIC Formatter and a BASIC Cross-Reference.

Native Translators Available. The IBM BASIC Compiler compiles or translates the BASIC programs you've written, down to native object code so they'll run on your IBM PC. And BASIC is just the beginning. DOS also provides the support you need to develop and run programs using the IBM Personal Computer Macro Assembler or the FORTRAN, COBOL, and Pascal Compilers.*

Two of these, the FORTRAN and Pascal Compilers, are available in recently updated versions. IBM PC Pascal 2.0 is based on the ISO standard, and IBM PC FORTRAN 2.0 conforms to the ANSI-77 standard subset level. Both new versions feature improved arithmetic capabilities, and both support the IBM 8087 Math Co-processor for greatly increased speed in processing floating point calculations. (For more about the Math Co-processor, see "Hardware News" in this issue of *Read Only*.)

In addition, versions 2.0 of the FORTRAN and Pascal Compilers feature a Library Manager for creating user-defined libraries and provide easy access to all files in any subdirectory through DOS path support. FORTRAN 2.0 supports linking of object modules with subroutines written in Pascal 2.0 and vice versa. Both new versions support linking of object modules with subroutines written in IBM PC Macro Assembler.

There's a bargain in store for those who already own the 1.0 versions of these compilers: you have the option of buying an upgrade to the 2.0 version at a substantial savings from the full 2.0 price.

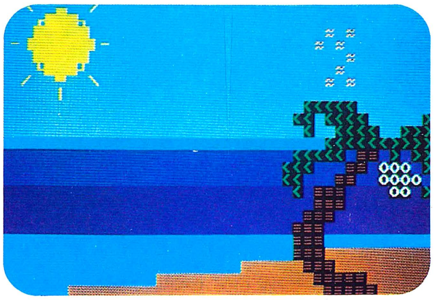
To ensure that your programming reach doesn't exceed your grasp, the IBM PC APL Interpreter enables you to write and edit your own programs in APL. It can also be used to exchange data files and workspace between your IBM PC and many mainframe computers.*

Finally, if you're inclined to make serious use of the IBM PC's array of programming aids, we suggest that you also take a look at the recently announced IBM PC Sort program. It provides support for data types and file organizations used by the IBM DOS-supported languages mentioned above and can significantly speed and streamline your programming efforts.

Application development tools from IBM

IBM PC Sort can be used as a stand-alone utility, integrated into a batch job stream, or invoked directly from a COBOL program via the Sort verb. It can sort records from a data file or files, merge multiple input files, selectively include or exclude records, and create an output file containing the records, pointers, or keys from the input files. There are no arbitrary limits in IBM PC Sort for file size, record length, number of keys, or number of input files.

Now Get Organized. The IBM PC's ability to run a wide variety of commercially available programs and to help you develop your own applications may result in a good news/bad news situation. The good news is that you'll be able to satisfy your application requirements. The bad news is that you'll probably be the one responsible for keeping track of your growing library of programs. If, as we've often found, enthusiasm outstrips organization, you may find yourself falling behind—especially if you're working in an area, such as small business finance or education, where programs multiply rapidly.



Animation Creation software from IBM

Fortunately, help is in sight, in the form of Fixed Disk Organizer, an IBM software package that does just what its name suggests.

Fixed Disk Organizer has a master menu that lets you sort out your various application programs by category—word processing, spreadsheet, communications, and so on. You can tailor the menu to your specific application needs by adding new menu categories, revising or deleting existing categories, or changing titles. The master menu allows you to review all the programs stored on your fixed disk at a glance and to call them up quickly with just a couple of keystrokes.

Fixed Disk Organizer also helps protect sensitive data by allowing you to create passwords and restrict access. It also enables you to write a string of complex DOS commands into a batch file and execute them whenever you want simply by selecting that file from the menu. And in case part of your organizational problems stem from not always remembering just how things are organized, you can use Fixed Disk Organizer to establish Help files as a reminder.

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*BASIC Compiler and Macro Assembler will run on the IBM PCjr. APL Interpreter will not. Although the IBM PCjr does not support FORTRAN, COBOL, and Pascal Compilers, most of their output will run on the PCjr if there is sufficient storage.

So we're all in trouble—no more excuses for not being organized.

Moving Pictures and Mathematical Castles. Let's not forget that there's more to life than programming, compiling, and getting organized. There's also software from IBM for pure enjoyment and for enjoyable education. Two such packages are Animation Creation and Adventures in Math.

Adventures in Math incorporates math drills into an adventure game with vivid color graphics of a castle and its passageways and treasures. To find the way out—and to uncover as many treasures as possible along the way—children (or particularly skillful adults) have to solve basic math problems. The program's difficulty level increases as you solve the problems you're confronted with.

Using Animation Creation, you or your children can draw your own pictures and watch them come to life. To draw pictures, you select from 254 computer characters and position them on your screen. Add color by choosing any of 16 foreground and 8 background colors. Then, by slightly repositioning the images on successive screens, you can create animation.

Next stop, Hollywood.

HARDCOPY

You Can't Enjoy the Game without a Program. Earlier in this issue (see "On the Storefront"), we discussed the Customer Support System for online information about IBM Personal Computer products. Much of that information is also available in two publications: *The Guide,* a directory of Personal Computer offerings from IBM, and *The Library,* a directory of IBM Personal Computer software offerings. If you want to enjoy the personal computer game, these are the "programs" you need to do it.

The Guide, published twice a year, is a catalog that contains clear, concise descriptions of IBM PC, IBM PC XT, IBM PCjr, and IBM *Portable* PC systems. It also reviews printers, video displays, expansion units, and all other IBM PC hardware products. A separate section of *The Guide* contains articles on IBM PC software packages.

Both hardware and software articles are illustrated with annotated color photographs—of key screens for the software packages—and start with charts that provide quick product overviews. Other noteworthy features include sample configuration tables for all three systems and a closing section on Sales and Service Support.

The Guide
to personal computer offerings from IBM
The Library
IBM PCjr

The Library, updated quarterly, presents an overview in booklet form of the entire IBM PC software product line. It presents the software by category, with sections on Operating Systems and Languages, Personal Productivity, Communications, Business, Education, and Entertainment. Program descriptions are brief and to the point. Each includes a short overview, program highlights, and system requirements. There's also a chart at the end of the booklet that shows at a glance which programs are compatible with the IBM PCjr.

Or the Hardware without a Manual. If *The Guide* and *The Library* are the general road maps to IBM PC products, the *Technical Reference* and *Hardware Maintenance and Service* manuals*—now available in newly updated versions—are the detailed maps of downtown. It's not a trip everyone wants to take, but if you do, these are the right directions.

There's a three-volume *Technical Reference* set for the PC and another for the PC XT and *Portable* PC. These manuals include the functional specifications for the system units and for the options and adaptors in the IBM PC product line. The *Hardware Maintenance and Service* manual details many aspects of troubleshooting a personal computer from IBM. It includes a parts catalog, a section on preventive maintenance, and instructions for identifying the failure of a replacement unit.

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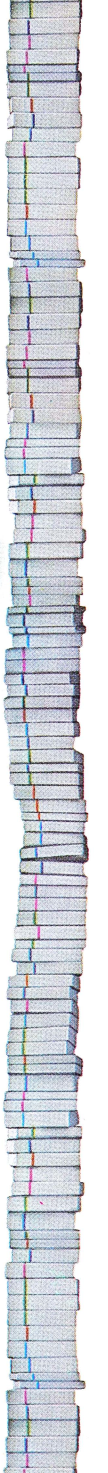
*These manuals are intended for use by technically qualified service personnel.

TIPS AND TECHNIQUES

If you use Personal Editor—IBM's full-screen editor for writing programs and brief documents—but find yourself displaying the Help file whenever you forget a function key assignment, here's a little help from the fellow forgetful.

Function key assignments can easily be displayed on the command line of your Personal Editor screen by assigning F1 to display the unmodified keys and alt+F1 to display the alt+Fx keys. You can then assign the Help function to alt+H, although you probably won't need it nearly as often as before.

The macro for the F1 assignment can be written as follows: def f1 = [cursor command] [begin line] 'F: 2=Save 3=File 4=Quit 5=Erase 6=EraseEOL 7=Print 8=Switch 9=InsL 10=Ins&Indt' [cursor data].



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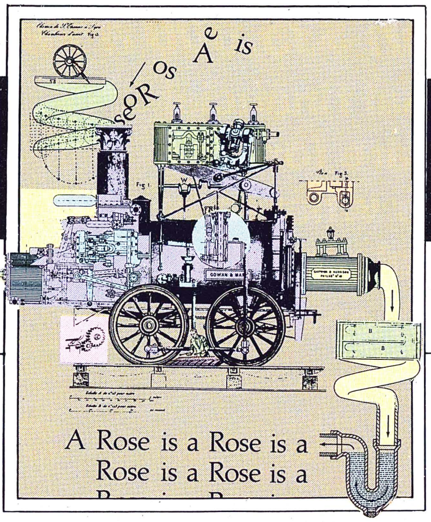
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by Terry Tinsley Datz and F. Lloyd Datz

The Leading Edge

Leading Edge, the new word processor from the company with the same name, bends over backward to please. What could be more reassuring than knowing that any text you erase—whether a word, a sentence, or a three-page block—is stashed away on disk ready for a quick comeback should you change your mind? What's more, *Leading Edge* organizes your documents into folders, allows a gracious thirty characters for filenames, and automatically saves your work to disk every time you take your hands away from the keyboard.

Curbside service of this sort isn't free, however. You may find yourself wondering if you couldn't do with a little *less* help when your disk space fills up with scraps of text you no longer need or when your thirty-character filename gets whittled down to a cryptic code that has to be cracked before you can do a simple *copy* from DOS. What's more, the distraction of having your disk drive go for a spin every time you pause to collect your thoughts can wear on you.

Overall Design. *Leading Edge* leaves none of the PC's keys unpressed. From the function keys to scroll lock, print screen, and the minus key in the numeric keypad—every key does multiple duty. With all eighty-three keys in on the act, it's no wonder that this program sports a billboard-sized keyboard overlay.

The first screen to greet you is a combination main menu and file directory. The file directory fills this screen, except for two lines at the bottom where the ten-option menu squeezes in. Getting started is a twofold operation: First, you move an inverse-video bar, called the document selector, to the file that you want to work on; then you move the action selector, another inverse-video bar, to the menu option you want. To finalize the command, you hit the plus key in the numeric keypad (*Leading Edge* calls this the *execute* key). If you're used to hitting return to enter commands, get ready for a few terse messages steering you to the right key.

Text Entry and Editing. The editing screen crams a wealth of information into its top four lines, freeing the remainder of the screen for text entry. Leading off is a status line that displays error messages and tells you the name of the file you're editing, the mode you're in (overtype or insert), and whether caps lock or num lock is engaged. The second line shows the current time and date and keeps track of the cursor's location by column, line, and page number. Below the status area is a ruler, and below that is a request line reserved for special prompts.

Leading Edge has a cursor move for every occasion—no fewer than twenty-five in all. As you'd expect, for the basic moves—by character, line, and screen—you use the arrows and the page-up and page-down keys. To get more distance out of the cursor, you combine these keys with control and shift. Hitting shift plus the left or right arrow, for example, takes you forward or backward by word, while shift combined with the up or down arrow jumps the cursor to the previous or next punctuation mark. Teamed with the control key, the arrows take you to the top and bottom of the screen and to the left and right margins. But that's not all: You can jump to the top or bottom of the current, next, or previous page as well as go directly to a specific page number.

For text entry you can choose between insert or overtype mode; overtype is the default. A true pack rat, *Leading Edge* has a recall buffer where it stashes, among other things, scraps of text that get in the path of the cursor while you're in overtype mode. On those inevitable occasions when you forget to switch to insert mode before adding something in the middle of your text, you can just put the cursor back where you started typing and hit control-delete; the text you typed over will reappear character by character. If you hold down control-delete too long, however, anything that you've overtyped at other locations will also begin to make a reappearance.

The insert key switches you into insert mode, and the cursor (an underscore character in overtype mode) plumps up a little to alert you to the mode change. Although existing text is shoved ahead to make way for new text, full-speed typing causes the screen to lag behind significantly. A way to get around the screen lag is to type new text into a scratch pad

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Terry Tinsley Datz and F. Lloyd Datz are the authors of Word Processing with Your IBM PC, PC XT, or PC Compatible, *recently published by Hayden Book Company.*

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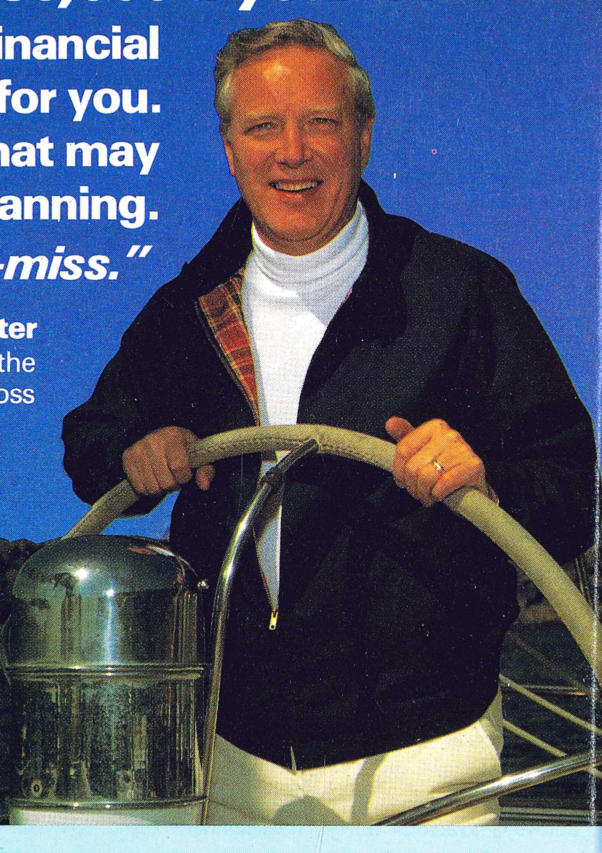

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and insert it only after you've doodled and experimented and have everything perfect. With this method, which *Leading Edge* calls *block insert*, you position the cursor where you want the insertion to go, hold down the shift, and hit the insert key. A couple of horizontal lines cordon off a scratch pad at the cursor position, where you're free to type and edit. When you're finished, hit the execute key and your text will be officially inserted and the surrounding text automatically reformed. In fact, one thing you never have to worry about is manually reforming your text after finishing an insertion or deletion; *Leading Edge* does a fine job of automatic reforming.

Deletion options, unfortunately, are in short supply. The only ways to do quick erasing are with the delete or backspace keys, both of which work as you'd expect (if somewhat slowly). Anything you delete with either of these keys goes to the trusty recall buffer and can be retrieved if the need arises. To recall something you deleted with the backspace key, you hold down control-backspace, keeping both keys down until you get everything back that you want (the most recently deleted text comes back first); to restore what you've erased with the delete key, you hit control-delete. There's only one recall buffer for both keys, however, so if you accidentally hit control-delete to reinstate something that you erased with the backspace key, your text will come in backward.

Conspicuously absent are specific commands for deleting by word, line, sentence, or paragraph, which means you have to resort to deletion by block whenever you want to erase more than just a few characters. You start by pressing shift-delete and highlighting the text you want erased, using any of the cursor keys. When you hit the execute key, your text goes to a kind of electronic Death Row, a holding area where all block deletions await a reprieve.

Leading Edge stores the deleted scraps on disk until you either reinsert them or use a special command to wipe out the ones you're sure you won't need. Should you decide that you want one of your deletions back in its original spot, you press alt-delete. This summons a directory that lists the first few words of each deleted block along with the time and date you erased it. You move the inverse-video selector to the block you want reinstated and press the execute key.

Leading Edge has several variations on its cut-and-paste feature. On the simplest level, to move a section of text to another location in the same file, you hit F9, the cut key. *Leading Edge* responds with *Cut What?*, prompting you to highlight the words you want moved. After positioning the cursor at the new location, you hit F10 to paste the highlighted section. As long as you don't cut any additional text in the meantime, however, you can continue editing and do the pasting at your convenience.

A twist on the quick cut-and-paste procedure, called *named cut and paste*, lets you store multiple blocks of text on disk for each file—fifty-two blocks to be exact—by giving each block a one-letter name. When you want to paste one of your named sections of text, you hit shift-F10 followed by a question mark to call the directory of named blocks for the file you're editing. Or, if you know the code letter for the section you want to paste, you can dispense with the directory and just type the shift-F10 combination and the appropriate letter.

You can also cut and paste between two files by using split screens. To accommodate a second file, the screen splits horizontally; the minus key in the keypad switches the cursor between windows. Unfortunately, one thing *Leading Edge* won't let you do is load the same file into both windows and edit two different parts of it.

Strangely enough, *Leading Edge* doesn't have a separate command for copying blocks of text. Instead, the cut-and-paste feature does double duty, copying blocks as well as moving them. What this means is that you have to paste *twice*, the first time to restore the block at its original location, the second time to copy it to the new location.

Although *Leading Edge* offers a full range of search-and-replace options, putting those options into play isn't easy. For example, to search for whole words, you have to insert a wildcard character before and after your search string by holding down alt and typing a question mark. To have differences in case ignored, you have to hold down the alt key with your left hand while you slowly peck out the search string with your right.

Leading Edge further complicates the search process with its quirky behavior. As soon as you type the first character in your search string, the program takes off looking for that letter, even though you can enter as many as eighty characters. What's worse is that you can't see the string as you type it in because the letters show up s-l-o-w-l-y, one by one.

On the plus side, *Leading Edge* has a few fancy editing tricks up its sleeve. It can automatically transpose the order of two characters as well as reverse the case of text that you've already typed (changing pcJR to PCjr, for example). A related feature will reverse only letters of a particular case (changing PCjr to pcjr).

Also convenient are placemarkers, which can be used to label spots that you want to

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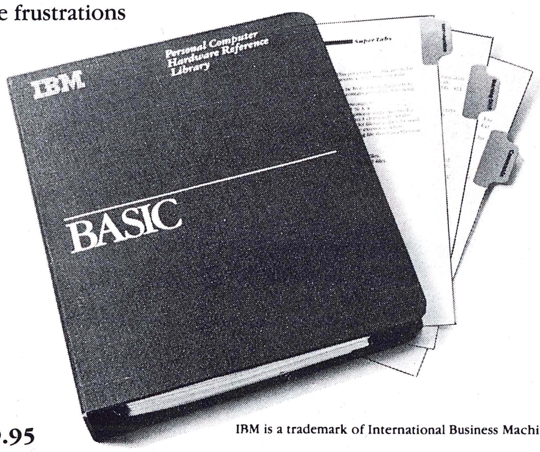

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DEBUG

come back to. You can insert up to four markers in any one file, using numbers 1 through 4. The markers don't display on-screen, however, so there's no way of knowing which numbers you've assigned and which ones you haven't.

Another timesaver is *Leading Edge*'s elaborate glossary system, which stores both text and keystrokes for quick recall. One of the more impressive things you can do with a *Leading Edge* glossary is store a series of formatting commands. Then, every time you start a new file, you can take care of margin setting, tab stops, line spacing, and the like with just one keystroke. There are many other uses for glossaries—changing format in the middle of a file, inserting boilerplate paragraphs, and doing simple form letters, to name a few.

Each glossary file can have up to fifty-two entries, each with its own one-letter code name. Once you've named your glossary (using as many as thirty characters), you're set to add individual entries. In order to add a text entry to your glossary, you must already have typed the text that you want to add; then you press shift plus scroll lock, give the entry a code name, and finally move the cursor over the text in question to highlight it. Saving a series of keystrokes works the same way, except that you respond to a prompt that asks what keystrokes you want remembered before you assign the entry its one-character name.

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When you want to insert a glossary entry into your text, you hit scroll lock again and type the code name for that entry; if you can't remember the code, you type a question mark to call the directory of entries. A word of warning: If you forget to switch to insert mode, your glossary entry will overtype existing text (this is one time you'll be grateful for the recall buffer).

Formatting and Printing. *Leading Edge* does most of its formatting on-screen. Other than insisting on single spacing no matter what line spacing you choose and leaving out a few special printing effects, it displays your text just as it will print.

You set margins and tab stops by means of format lines (rulers) that can be inserted or cut and pasted as needed; for fine-tuning, there's a special format menu. Whenever you open a new file, a format line with the program's default settings automatically takes its place at the top. To change formats, you can either edit the format line currently in force or insert a new one.

Let's say you've just started editing an old file and you decide to change its margins. You tap F3 to activate a special cursor in the format line, then move that cursor along the line to wherever you want the new margins. If you want your text fully justified, for example, you hit *J* when the format cursor is over the column where you want the right margin. Using a similar procedure, you can adjust tab settings. It's especially easy to tell where you want your tabs because the cursor trails along in the text entry area, echoing the position of the format line's cursor.

You can also insert a new format line anywhere in your text by hitting shift-F3 and going through the same procedure. In either case, if any text is already on-screen following the format line, it quickly scrambles to conform to the new settings. What's also nice is that each format line is accompanied by a graphic character (the PC's sun) that you can use to delete the line or move it to another location.

To change other format settings, you call the format menu (with control-F3) and select the feature you want to change, then follow the prompts. This system won't win any awards for speed, but it does keep you from having to remember individual commands. For example, to change from single to double spacing, you choose the line-spacing option, press execute to call a submenu, and finally choose the spacing you want. You follow a similar procedure to set pitch, lines per inch, and the minimum number of lines you'll allow for orphans and widows.

If you're picky about page breaks, the orphan and widow option can save you some last-minute adjusting. If you set widow size to two words, for example, the program won't abandon the first line of a paragraph at the bottom of a page; instead, it will move the entire paragraph to the beginning of the next page. Orphan control works much the same way but prevents the last line (or any number of lines you specify) of a paragraph from being isolated at the top of a page.

Until you give the pagination command, however, *Leading Edge* treats your text as one long page. When you give the go-ahead to paginate, the program starts at the beginning of your file and inserts a dotted line between each page, along with a graphic character (the happy-face symbol) that allows you to delete the break if you don't like it. You can also paginate as you edit by hitting F8 wherever you want a break to occur. If you later give the paginate command, however, any breaks set in such a way will probably end up being changed. To set a hard page break—one that absolutely must not be moved—you use control-F8.

The same attention to detail holds for temporary margins and tabs. In addition to regular tabs, you can set decimal tabs, which can be either standard U.S. format or international format (with commas and decimal points reversed). You can also center your columns over a tab stop, align them flush right, or have dot leaders inserted between them for tables of contents and the like. As a help for outlines, indented quotes, and other tricky formats, you can have your text automatically indented in increments that correspond to the tab settings in force. An unusual twist of this feature will *outdent* your text in the same increments—a convenient method for working your way out of multiple indents when you're typing an outline.

Leading Edge supports a full array of special printing features, including underscoring, boldfacing, superscripts and subscripts, italics, doublewide characters, ribbon shift, and color printing (on the IDS Prism line). There are two ways to gain access to these features: You can either apply them to text you've already typed, or you can have them automatically applied to new text as you type it. If you select the apply-as-you-go option, though, the screen constantly lags behind even a relatively slow typist.

With both procedures you have to suffer through the print attribute menu, plus at least one other submenu, and you have to stroke an incredible number of keys. If you stick with just one special effect, however, you get a reprieve: You can reapply the attribute you last used just by pressing F5 and highlighting the text you want emphasized.

Instead of cluttering your screen with markers that show where such effects begin

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and end, *Leading Edge* highlights the text in inverse video (except underlining, which shows up as such, and doublewide characters, which have an extra space between them). The absence of markers makes for a clean screen but, at the same time, wreaks havoc when you try to delete your hard-won special effects. If anything, deleting them is worse than inserting them. You have to go back to the print attribute menu, highlight the emphasized text, and select the "off" option.

Leading Edge doesn't do automatic footnoting but does headers and footers nicely. You can have them printed on each page—or on odd- or even-numbered pages if you want to print them book style. Switching to a different header or footer in midfile is no problem, either: Just indicate the page where you want the new header to start. Normally, headers and footers don't appear on-screen during editing, but if you'd like a preview you can ask that they be displayed on each page exactly as they'll print.

Printing your work requires a trip back to the main menu, where you position the document selector on the file you want printed (it automatically comes to rest on the file you just edited), then select the print option. From the print menu, you have several choices, including doing a partial print, printing multiple copies, or printing an unformatted (draft) copy of your manuscript. You can also switch between printers, a handy option if you have both a dot-matrix and a letter-quality printer. Once the printing has started, you're free to edit another file as long as you're in no hurry; between printing and editing, the program uses the data disk almost nonstop, which means it rarely has time to accept your keystrokes.

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File Handling. *Leading Edge* is a file clerk extraordinaire. It stores each file inside a folder, which in turn "lives" inside a drawer. Each drawer (*Leading Edge* jargon for disk) can hold thirty-two folders. Similarly, each folder can accommodate up to thirty-two files, depending, of course, on how long those files are. The idea is for you to group like documents together in folders. For example, one folder might hold all the correspondence with a given company; another might contain all the letters you write during a day.

Each time you start the program or come back to its main menu/directory screen for whatever reason, you're shown the directory for the folder you last used, with the document selector highlighting the last file you edited. At the top of the screen is a status area that tells you the name of the current folder, the active drawer (disk drive), and the percentage of disk space occupied. Underneath is information specific to the individual files in that folder, including each file's name (up to thirty characters), its length in pages, the date and time it was created, and the date and time it was last revised.

Each folder includes a file called *standard document*, which initially contains nothing more than *Leading Edge*'s default format settings. Every time you open a new file in that folder, the program copies the standard document to the top of your file. If you group like documents together in folders, it's worth your while to customize the standard document for that format. You might want to include settings for margins, line spacing, justification, and tab stops; going a step further, you might even insert text that you want to appear at the top of each file. For example, if you don't have a printed letterhead, you might want to have your company name and address automatically inserted.

If you're a stickler for organization, *Leading Edge* can provide hours of fun just by letting you shuffle your files between folders. At the bottom of the main-menu/directory screen are options for deleting, copying, or renaming a file in the active folder, as well as moving or copying a document to another folder. Logically enough, to work on a different folder, you use the *folder* option in the main menu. This gives you a listing of all the folders on your disk plus nine new options. These options let you start a new folder, call the document directory for another folder, transfer a folder to another disk, and delete, rename, or copy one of the folders.

Firmly committed to safety, *Leading Edge* isn't about to let you lose your work through carelessness. Each time you begin an edit, it automatically makes a backup copy of the unchanged version of your file. Interestingly, however, backup files don't show up in the file directory; the only way to edit a backup file is to activate it by means of a utility option on the main menu.

Another of *Leading Edge*'s safety tactics is to take complete responsibility for saving your work. In fact, nowhere in the program is there a command to do a save. How can that be, you ask? Simple—every time you take your hands away from the keyboard for longer than ten to fifteen seconds, the disk drive light comes on and onto disk goes anything you've typed since last you rested. There are obvious advantages to an automatic save: It frees you from having to remember to stop and save your edits, and it minimizes the amount of work you lose in the event of power failures and other disasters. Unfortunately, the disk activity usually starts just about the time you're ready to resume typing. Although there's nothing wrong with forging ahead, you can't see what you've typed until the save is completed. In all fairness, the automatic save usually doesn't take long, barring cases in which you've been typing nonstop for a prolonged period.

When you're finished with an edit, you hit escape and *Leading Edge* automatically saves the completed version of your file to disk before returning you to its main menu. In fact, there's no other way to get out of an edit, with the possible exceptions of yanking your disk out of the drive or pulling the plug. Even in those cases, your work will be intact on the disk—except for those last few things that haven't yet been saved. When you reopen a file after quitting the program in a nonstandard way, *Leading Edge* tells you that it's checking for damage. In rare instances, a file may be ruined, in which case you'll be asked to activate its backup.

Although the only limit on file size is the amount of disk space free, *Leading Edge* has a way of quickly eating up that space. For example, every time you delete something, whether just a couple of characters or a massive block, the deleted text sticks around on disk, as do cut-and-paste blocks, the standard document file for each folder, and backup copies for each file. Unless you have a hard disk, you'll need to do some periodic housecleaning—emptying the recall buffer, deleting unwanted cut-and-paste text, and so forth.

You can tell whether you're getting low on disk space by checking the "percentage full" display in the main menu and by watching for the "low disk" message that may appear while

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you're editing. Unfortunately, the latter message isn't likely to prevent the disaster of creating a file that takes up more than half the available disk space. In such a case, everything will seem fine when your "megafile" goes to disk at the end of the editing session. The problem will come when you try to reopen it for another edit. If there's not enough space on disk to create a backup copy, *Leading Edge* will stubbornly refuse to open your file—a catastrophe not unlike building a boat in your garage and finding out that it won't fit through the door.

Although *Leading Edge*'s thirty-character filenames make for creative titles, try finding those files in the DOS directory when you want to do a quick *copy*. Only with a little ingenuity, or possibly a phone call to the folks at Leading Edge, can you translate F01D0025 and the like back to the original name you used. There's something to be said for simplicity.

It should come as no surprise that *Leading Edge* doesn't store text in standard ASCII. If you want to use a spelling checker on one of your files, you'll have to convert your file to ASCII (using a special utility), run the checker on the converted file, and finally go back to the original version for corrections.

Merge Print. Available from Leading Edge at extra cost, *Merge Print* is a simple program for churning out form letters. You can create your mailing lists with *Leading Edge* or with *dBase II*, *1-2-3*, or any other program that allows you to make an ASCII file (if you use *Leading Edge* to create your list, you'll have to run it through the conversion utility to get an ASCII file).

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The procedure for creating a mailing list is simple: You type all the information for each record on one line, using up to 200 characters for each and separating fields with backslashes. Merging that information into a form letter is easy because you don't use variable names. Instead, you place field numbers wherever you want data inserted.

For example, if the first field for each record in your data file is a person's name, you'd insert a *1* into your form letter wherever you want the name printed. If you want to include only part of the data from a field and insert, say, a person's first name, you can use a field specifier such as 1.1, which selects the first word of the first field. By using a hyphen between field numbers, you can indicate that you want a range of data inserted. For example, the field specifier 1.1-1.3 tells *Leading Edge* to insert the first through third words of field 1.

When you're ready to print your form letters, you choose the *print* option from the main menu, then select the *merge* option from a submenu. From here, still another menu takes you through specifying the filenames that contain your form letter and mailing list data; if you want to merge only selected records, you indicate where you want the merging to start and stop.

Documentation and Support. *Leading Edge* comes with more than its share of learning aids. You get a stand-up cue card with instructions for most essential operations, a quick-reference card, and a mammoth keyboard overlay. In addition, a ninety-two-page training manual aimed at beginners takes you through installation plus basic editing and formatting. Unfortunately, the step-by-step instructions for installation leave you high, dry, and uninstalled. However, those who bypass the training manual will have no problem, since the instructions in the main manual are correct.

The manual itself has an impressive look. Its 250 colorful pages are divided into no fewer than twenty-seven tabbed sections. Heavy on sample screens, charts, and diagrams, the manual tells the *Leading Edge* story in a very visual way. In fact, there's not much to read in this manual, and what reading material there is takes the cookbook approach. There are times when you'll want more information; sometimes that information is just not there, and sometimes it's hidden in an unlikely spot. But since the manual has no index, you may give up the search only to come across that information later when you're looking for something else.

The people at Leading Edge are committed to supporting their word processor. They have a toll-free line that's accessible even to new owners whose registration cards aren't yet on file—which is nice, since that's when most questions come up.

The program disk isn't currently copy-protected (even though the training manual tells you it is); however, the Leading Edge staff says that that policy could change.

Ease of Learning and Use. Because you get so much help, most of *Leading Edge*'s features are easy to learn. You can often find out what you need to know from either the keyboard overlay or the cue card. There's also a superb on-line help system. By hitting F1 twice followed by the key you want help with, you can get a detailed run-down on the functions of that key.

Since it carries a lot of bulk, *Leading Edge* isn't terribly efficient. The menu system, though nice for first-timers, exacts a toll in terms of extra keystrokes. The same is true of the folder filing system; simply copying a file to another disk is a major process. Whether or not you like the keyboard implementation will probably depend on your typing skills. Expert typists may be slowed down by having to roam all over the keyboard to enter commands. However, true to the *Leading Edge* claim, if you're a marginal typist you can hunt and peck until you find what you're looking for.

Summary. *Leading Edge* is a mixed bag. It's a capable word processor that goes out of its way not to overwhelm. Its on-line help, unusual file structure, and security system are likely to be appreciated by first-timers. There's a fine line, however, between being helpful and being just plain overbearing. The problem with *Leading Edge* is that you can't tell it to back off when you've had enough.

System Requirements. You'll need two double-sided drives and 256K—unless you own the Leading Edge PC, in which case you can get by with 128K. As for the other IBM compatibles, because *Leading Edge* makes such extensive use of the PC's keyboard, the program works with only a select group. If you're in doubt about your machine, check with Leading Edge. Although the program currently comes with direct support for only a few printers, the Leading Edge crew says it'll furnish, at no charge, a driver for just about any printer on the market. ▲

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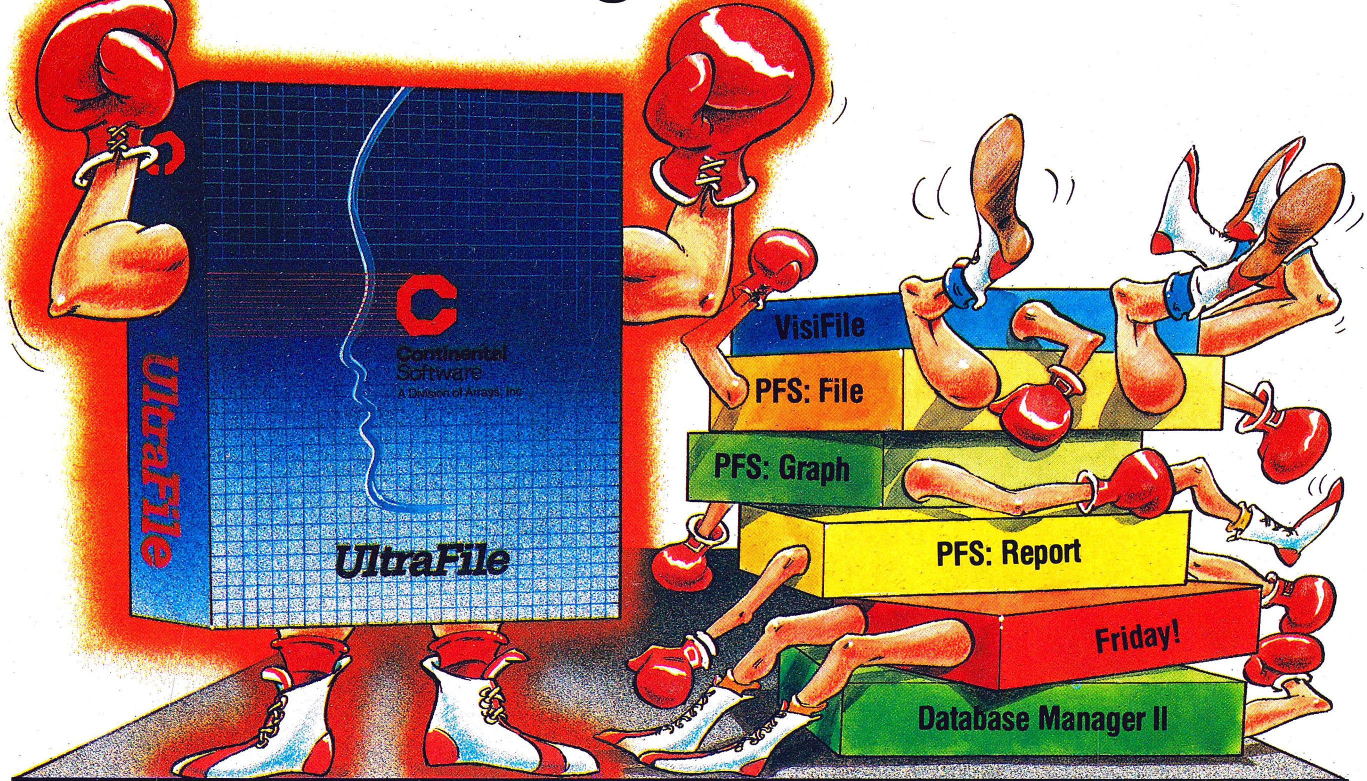

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Thirdly, UltraFile has automatic data formatting. So if you want a certain word in your text to appear in all caps, you only have to enter it that way the first time. UltraFile automatically capitalizes the word each time it appears. That means fewer errors and more consistency in your text.

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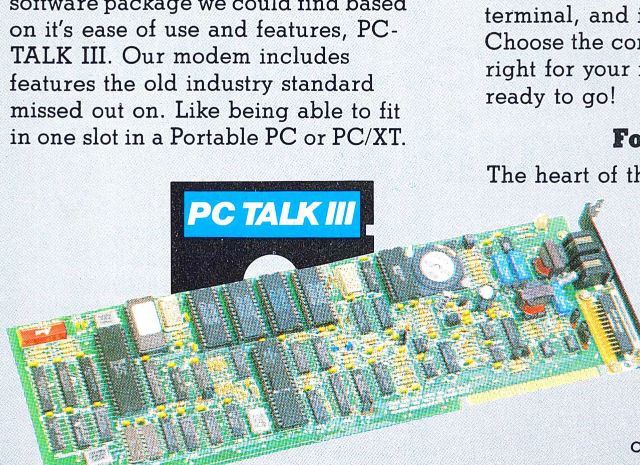

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TRADETALK

∆ **Interactive Systems** (Santa Monica, CA) has elected **Marvin L. Goldberger**, president of California Institute of Technology, and **Thomas P. Kemp**, chief operating officer of the beverage group of Beatrice Foods, to its board of directors.

∆ The proposed acquisition of **Business and Professional Software** (Cambridge, MA) by **BPI Systems** (Austin, TX) has been canceled amicably by both firms. Randall W. Ferguson, chairman and chief executive officer of BPI, said that both companies believed their long-term interests would be better served without acquisition or merger.

∆ Formed to monitor legal, legislative, and regulatory developments affecting the operations of computer-related companies doing business in Texas, the **Texas Computer Industry Council** (Austin, TX) will also provide educational and social opportunities to its members. According to M. L. "Spec" Bradley, interim president of the council and group vice president of Informatics General (Dallas, TX), the council represents an effort to provide a forum for the exchange of ideas on topics of common interest to participants in the industry. The council will provide its members with updates on state-level public policy developments and will assist national computer associations in disseminating or collecting information in Texas.

∆ **Dataproducts** (Woodland Hills, CA) has appointed **Howard Rose** general manager of its newly created Hong Kong-based trading company, Dataproduct Trading (HK), Ltd. Rose will coordinate the "sourcing" of electronic components with Far East manufacturers for Dataproducts and other American manufacturers. The company has manufacturing facilities in California, Connecticut, New Hampshire, Ireland, Puerto Rico, and Hong Kong ∆ **Graham Tyson**, chairman of the board of Dataproducts, received the 1984 Founder of Hope award presented by Founders for Diabetic Research. Tyson is the first honoree of the newly formed computer and high-tech industry support group for the City of Hope.

∆ **Systems Plus** (Palo Alto, CA), **Ask Micro** (Folsom, CA), and **ComputerLand** (Hayward, CA) have agreed that Systems Plus will exclusively distribute Ask Micro's *Accounting Plus* to ComputerLand's 650 outlets nationwide. Ask Micro became the package's publisher when it acquired the authoring group, Software Dimensions, in July 1983.

∆ **Micro Peripherals Incorporated** (Salt Lake City, UT), a dot-matrix printer manufacturer, has received $2 million in private placement financing granted by Business Development Partners (Austin, TX), First Oklahoma Bancorp (Oklahoma City, OK), Interfirst Venture Corporation (Dallas, TX), Rothschild (New York, NY), and Meadows Resources (Albuquerque, NM). Ernest E. Campbell, president of MPI, indicates the funding will be used to expand manufacturing and sales operations and accelerate MPI's product development program.

∆ **The Book of the Month Club** (New York, NY) will be offering *Homeword* and *The Dark Crystal*, from **Sierra On-Line** (Coarsegold, CA) to its one million members.

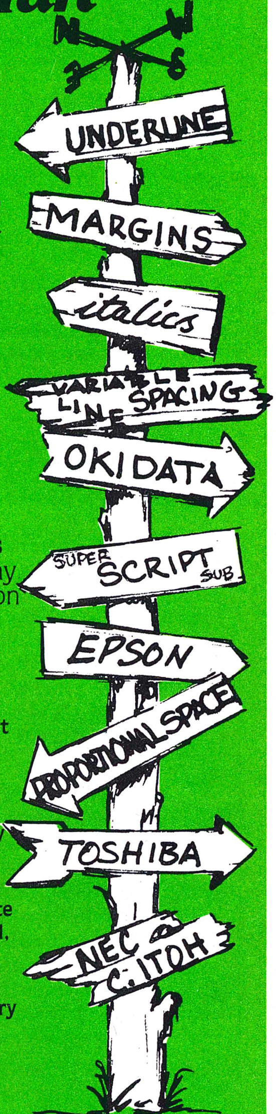
∆ **IDE Associates** (Bedford, MA), a manufacturer of PC peripherals, has completed its third round of financing for $3.25 million. The private placement was led by the Palmer Organization (Boston, MA), a venture capital firm.

∆ **Allenbach Industries** (Carlsbad, CA), a software-duplicating firm, will be moving this month to larger quarters in the Carlsbad Research Center. Said Allenbach's president Phil Kessler, "The additional space will allow us to have two distinct duplication areas, one specializing in long production runs, the other for smaller orders." A unique feature of the facility will be a day-care center for employees' preschool children. An after-school area for older children will include study areas and computer literacy classes.

∆ Further software-duplicating news: **Xemag** (Menlo Park, CA) has promoted **Matthew A. DeMarco** to branch manager for its recently inaugurated New Jersey regional software duplication center. DeMarco has responsibility for the operation, whose territory extends from Connecticut to Florida.

∆ **Lotus Development** (Cambridge, MA) has made *1-2-3* available to run on **Convergent Technologies's** (Santa Clara, CA) NGEN workstations. Lotus's Jim Kinlan, manager of OEM relations, said, "This is the fastest implementation of *1-2-3* that we've developed. It outperforms the PC by a factor of three to one. And we'll be releasing a Convergent-compatible version of *Symphony* in the fourth quarter of 1984."

∆ **Business Software Pty. Ltd.** (Chatswood, Australia) has contracted with **Software Distribution Services** (Buffalo, NY) to distribute



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August 2—5: First Annual Tampa Bay Computer Show and Office Equipment Exposition, Curtis Hixon Convention Center, Tampa, FL

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Δ **CompuCable Corporation** (Anaheim, CA) and **Technology Marketing Incorporated** (Irvine, CA) have signed a letter of intent to merge CompuCable with TMI in exchange for 900,000 shares of TMI's common stock. The completion of the acquisition is subject to finalization of an agreement and approval by the shareholders of both corporations. CompuCable manufactures and distributes microcomputer interface equipment; TMI specializes in the design and development of high-technology products for other companies, including computers and software, telecommunications systems, and other electronic devices and systems.

Δ **Palantir Software** (Houston, TX) has appointed **Robert VanIngan** senior vice president, marketing and sales.

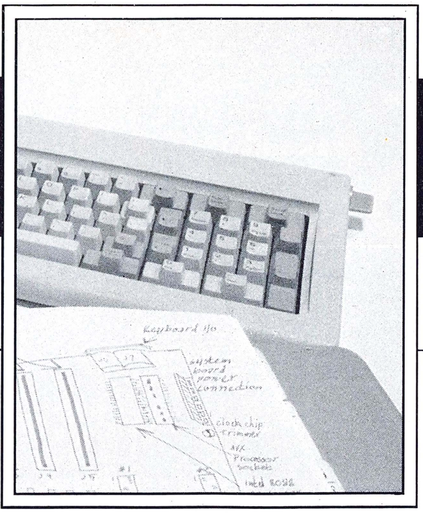
Δ **FirsTel Information Systems** (Denver, CO), the business communications equipment subsidiary of U.S. West, has become a remarketer of the PC and XT, which it will integrate with its PBX and key system telecommunications equipment for use as managerial workstations. The PCs and XTs will provide telecommunications management services, such as terminal emulation, keyboard dialing, messaging, electronic mail, calendaring, mapping costs of telecommunications equipment, and other office support functions.

Δ **Ungermann-Bass** (Santa Clara, CA) has licensed **Davong Systems**'s (Sunnyvale, CA) *MultiLink* software for local-area networks. A joint development agreement permits the two companies to share micro LAN technology.

Δ Davong has granted a license to **Standard Microsystems** (Hauppauge, NY) to include *MultiLink* as part of Standard Microsystems's LAN package. Standard Microsystems currently markets the COM 9026 and COM 9032 VLSI integrated circuits that provide communication control interface functions for an Arcnet LAN. The company plans to market its package through distributors, systems integrators, and OEMs.

Δ **Arrays** (Los Angeles, CA) has signed a letter of intent with **American Micro Products** (Richardson, TX) for the acquisition of all capital stock of American Micro Products, which develops and markets software for briefcase and notebook-sized computers on a contract and retail basis. Arrays intends to use the company's capabilities and personnel as part of Arrays's in-house research and development team.

Δ **Richard E. Khaleel** has been named president of **Scholastic's Software Group** (New York, NY), a newly formed division of Scholastic Inc. He will have full responsibility for the Software Group's editorial, marketing, catalog sales, and business operations. ▲



SYSTEM Notebook

by Alan Boyd

Ansi.sys, Part II

Last month we left off in the middle of an exploration of the Ansi.sys device driver supplied with DOS 2. So far we've seen how to install the device driver and make use of it for functions that involve positioning the cursor on the screen. We've also seen how to use the DOS *prompt* command to send ANSI escape sequences to the console device.

This month we'll continue exploring and discover how to control graphics functions via the Ansi.sys driver.

ANSI Escape Sequences for Graphics. There are three ANSI escape sequences that can be used with DOS to set and control graphics attributes. The first is the *set graphics rendition (SGR)* sequence. Using the *prompt* command again, as we did last month, we could enter the SGR sequence as

⟨escape⟩[#;.......;#m

where the ellipses represent multiple attributes set at the same time. The number sign in the sequence can be replaced with one of twenty-two available attribute settings, each of which is a one- or two-digit number. The parameters available are

# Parameter	Set Attribute
0	Reset all attributes (normal white on black)
1	High intensity on (bold)
4	Underscore on (monochrome display only)
5	Blink on
7	Inverse video on (black on white)
8	Canceled on (characters invisible)
30	Black foreground
31	Red foreground
32	Green foreground
33	Yellow foreground
34	Blue foreground
35	Magenta foreground
36	Cyan foreground
37	White foreground
40	Black background
41	Red background
42	Green background
43	Yellow background
44	Blue background
45	Magenta background
46	Cyan background
47	White background

By inserting these attribute numbers into the escape sequence, we can build just about any foreground-background color combination for DOS that we like, and we can have flashing colors if we wish.

An example or two of the use of these attributes is in order. Suppose you want the intensity of your prompt to be different from that of the normal video screen. To achieve this, you can issue the following command (you'd probably do this from a batch file):

```
PROMPT $e[1m$n$g$e[0m
```

This tells DOS to use the regular prompt (⟩A) but to show it in high intensity.

To get a better idea of what's going on here, let's dissect this particular *prompt* command string.

First, the *prompt* command tells DOS that we want to change the system prompt. The string of characters that follows will be emitted every time DOS puts the system prompt on the screen. Therefore, in response to this *prompt* command, DOS will not simply send the drive letter and the greater-than sign (A⟩), but rather the string *$e[1m$nge[0m*.

Whenever the system prompt mechanism sees the dollar sign, it knows that the characters that follow are encoded according to a specific internal scheme (see "System Notebook," December 1983, for details about this coding scheme). For example, the *$e* combination sends an escape character. Consequently, if the Ansi.sys driver is installed, the sequence *$e[1m* will be interpreted as the ANSI escape sequence

⟨escape⟩[1m

This sequence tells Ansi.sys to turn on the high-intensity attribute and leave it on until further notice. All characters that follow will be shown in high intensity.

The next sequence of characters, *$n*, tells DOS to send to the screen the identification letter of the currently logged disk drive (A, B, C, or whatever).

Next comes *$g*, which translates into the ⟩ character. This combination—the currently logged drive letter plus the greater-than sign—is DOS's normal system prompt.

Finally, DOS is sent the sequence *$e[0m*, which, because of the presence of the *$e*, is interpreted as an ANSI escape sequence. This sequence translates into the command to turn off all attributes and present all text following in low intensity, white on black. The Ansi.sys driver responds by turning off the high-intensity attribute set at the beginning of the *prompt* command.

The net result of this *prompt* command is that every time DOS sends out its system prompt, it turns on the high-intensity attribute, then re-creates the standard DOS prompt, and then turns the high-intensity attribute off again. Everything that passes across the screen, with the exception of the system prompt, will thus appear in normal intensity. To reset the prompt so that the high intensity is turned off, simply enter the *prompt* command with no argument.

Now let's take a look at some of the variations of the Ansi.sys SGR command.

First, suppose we want to operate in high intensity all the time so

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Come in late on "System Notebook"? All back issues of this column—from June 1982—are still available; for further information, see page 4. The columns will also be published soon, as a single volume, by Softalk Books.

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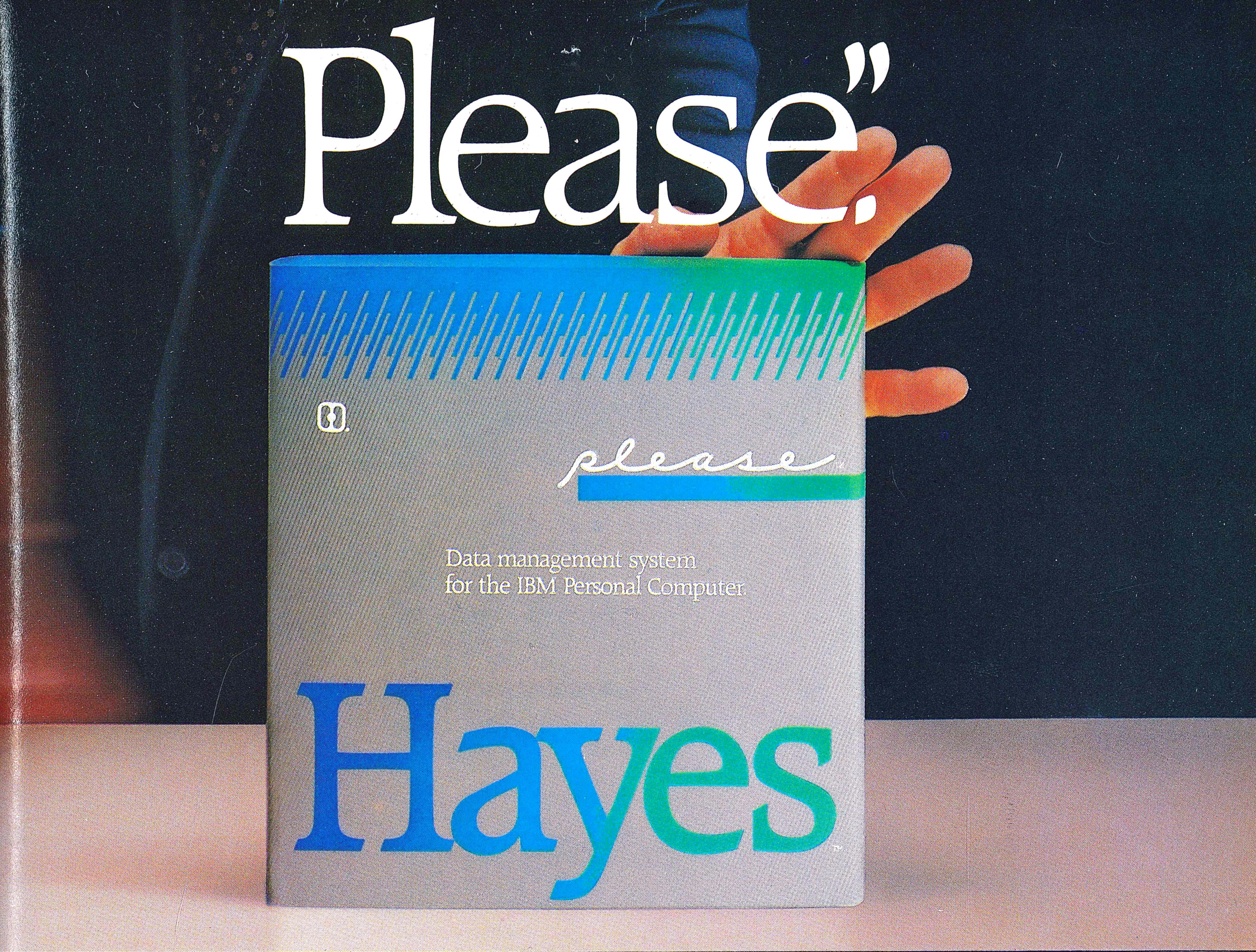

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that everything passing across the screen is displayed in bold. All we have to do is create a single prompt that sets the high-intensity attribute on, and then never turn it off. We could do this via the following batch file:

```
PROMPT $e[1m
PROMPT
```

The first of these batch commands tells DOS to change the prompt character to the escape sequence that turns on the high-intensity attribute, and the second resets the prompt to its default state. Since we never turn the high-intensity attribute off, all characters sent to the screen are shown in high-intensity mode.

If you use this scheme, though, you may be disappointed to find that many programs running under DOS reset the high-intensity attribute internally; the result is that when you run these programs the screen is reset to low intensity.

You can put other screen attributes to use from within the *prompt* command as well. If you have a monochrome monitor, for example, you can still underline your prompt, though you obviously can't use any of the color attributes. To do this, you enter the command

```
PROMPT $e[4$n$g$e[0m
```

Similarly, if you want your prompt shown in inverse video you can enter the command

```
PROMPT $e[7m$n$g$e[0m
```

And if you want it to blink, you can enter

```
PROMPT $e[5m$n$g$e[0m
```

At first glance, the invisible attribute might not appear to have any practical value. There are uses for it, however. For example, while communicating a file to a remote location, you may not want its contents displayed on your screen; by turning the invisible attribute on, you can achieve this invisibility.

The other attributes—30 through 37 and 40 through 47—are used to set the colors of characters. For example, if you have a high-quality RGB monitor attached to a color/graphics adapter, you can make the color of your prompt different from that of other items on your screen. The command

```
PROMPT $e[31m$n$g$e[0m
```

creates a red prompt, leaving all other screen display white on black. The command

```
PROMPT $e[31m$n$g$e[32m
```

sets the DOS prompt to red and makes all other characters on the screen appear green on black.

The attributes from 40 through 47 enable you to change the background color to something other than black. For example, the command

```
PROMPT $e[34;43m$n$g$e[36;44m
```

produces a screen guaranteed to cause eyestrain. The prompt will be displayed in blue on a yellow background, while the rest of the screen will show cyan characters against a blue background. (Notice that when your escape sequence sets more than one display attribute, you need to use a semicolon between attribute numbers.)

Here's an example of a batch file that lets you set your screen characters to whatever color you choose:

```
IF %1 == RED PROMPT $e[31m
IF %1 == GREEN PROMPT $e[32m
IF %1 == YELLOW PROMPT $e[33m
IF %1 == BLUE PROMPT $e[34m
IF %1 == MAGENTA PROMPT $e[35m
IF %1 == CYAN PROMPT $e[36m
IF %1 == WHITE PROMPT $e[37m
PROMPT
```

Let's suppose you named this file Color.bat. Then, for example, to set your screen to blue on black, you'd simply enter

```
COLOR BLUE
```

Similarly, to simulate a green-screen monitor on your RGB system, you'd type

```
COLOR GREEN
```

Let's leave SGR now and move on to the second and third ANSI escape sequences—*set mode (SM)* and *reset mode (RM)*. These two, which are similar in operation to each other (they differ in only one respect), are both used to select the operation mode of the video display in much the same way as the DOS 2 *mode* command is used.

The SM sequence takes the form

```
⟨escape⟩[=#h
```

where the # is replaced by one of the following single-digit parameters:

# Parameter	Set Attribute
0	40 x 25 black and white
1	40 x 25 color
2	80 x 25 black and white
3	80 x 25 color
4	320 x 200 color
5	320 x 200 black and white
6	640 x 200 black and white
7	End-of-line wrap turned on

The RM sequence takes the form

```
⟨escape⟩[=#l
```

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where the # represents a number selected from the same list of parameters as is used for SM.

The parameters for SM and RM, like all other escape sequences, can be entered via the *prompt* command. For example, to switch to a forty-column display with color attributes available, you could use the commands:

```
PROMPT $e[=1h
PROMPT
```

You could add more spice by turning on some of the color attributes via a command sequence like this:

```
PROMPT $e[=1h
PROMPT $e[31m$n$g$e[37;44m
```

The effect of these two commands is to put you in forty-column color mode, with a standard DOS prompt appearing in red and all other characters showing up white on blue.

There are essentially six types of graphics display devices that can be attached to a PC. The six display types and the SM modes that work with them are

Device Type and Equipment Required	Modes
1: Black-and-white television **+ RF modulator** **+ color/graphics adapter**	0,5,7
2: Color television **+ RF modulator** **+ color/graphics adapter**	0,1,4,5,7
3: Black-and-white composite monitor **+ color/graphics adapter**	0,2,5,6,7
4: Color composite monitor **+ color/graphics adapter**	0,1,2,4,5,6,7
5: RGB monitor **+ color/graphics adapter**	0,1,2,3,4,5,6,7
6: Monochrome monitor **+ monochrome adapter**	7

The first seven of these parameters (0 through 6) are self-explanatory and are treated identically by both the SM and RM command sequences (*prompt $e[=3l*, for example, would accomplish the same thing as *prompt $e[=3h*). The meaning of the last parameter, parameter 7, is less obvious. This one, moreover, has one effect in the SM sequence and an entirely different effect in the RM sequence.

When Ansi.sys receives

```
⟨escape⟩[=7h
```

any letters typed at the end of a line will automatically appear at the beginning of the next line. When it receives

```
⟨escape⟩[=7l
```

any characters typed beyond the end of a line will not wrap around to the next line and will therefore be lost.

ANSI Escape Sequences for Keyboard Redefinition. The last function for which ANSI escape sequences can be used is perhaps the most useful. Escape sequences can be sent to the Ansi.sys driver to reassign any of the keys on the PC's keyboard. That means that if you don't like the way the keys are now arranged, you can rearrange them. You can even use Ansi.sys to assign strings of characters to function keys.

To understand how to redefine keys, you must first understand a little of how the PC's keyboard works. When you press a key on the keyboard, what you see on the screen is usually the same character that is on the key you pressed. You might assume, then, that the keyboard has generated the ASCII number representing the key in question and passed that number to the screen. Not so, however.

When a key is pressed, the keyboard, which contains its own Intel 8048 microprocessor, generates what is known as a "scan code." This code tells the PC the location of the pressed key. Scan codes are determined entirely by the geographic locations of the keys on the keyboard. When DOS receives a scan code, it looks it up in a table and generates the appropriate ASCII value, which it then sends to the screen to be displayed as a character. The Ansi.sys driver, when installed, can be thought of as a black box placed between the keyboard and DOS. With Ansi.sys installed, you can customize the scan code replacement table.

The IBM PC uses an "extended" ASCII character set. The first 128 characters in this set, those with ASCII values 0 through 127, are the same on the PC as on any other ASCII computer; this much of the character set is standard. The rest of the character set—those characters with ASCII values from 128 through 255—are peculiar to the PC and its clones. You can produce these nonstandard characters with the help of the PC keyboard's alt key.

If you're not familiar with this use of the alt key, you can do a little experimenting to see how it works. It's best to do this at the DOS command line, with no device drivers installed. This way you can be sure that there is no software intercepting your key presses and reassigning them. Hold down the alt key and keep it depressed while you enter a number between 0 and 255 on the numeric keypad. When you have entered the number, release the alt key, and the ASCII or extended-ASCII character assigned to that number will appear on the screen.

In some cases no character will appear, but something else may happen. For example, if you enter the number 16, you'll cause your printer to echo any further screen output (in other words, whatever appears subsequently on your screen will also appear at your printer). This is because ASCII 16 translates to control-P, which is the toggle that turns on printer echo (a second ASCII 16 or control-P will turn the echo off). By entering characters via the alt key—that is, entering their ASCII numbers—you can produce any member of the PC's character set, including the smiling faces, card suit characters, and all those block graphics characters.

If, however, you attempt to send any of the nonstandard characters

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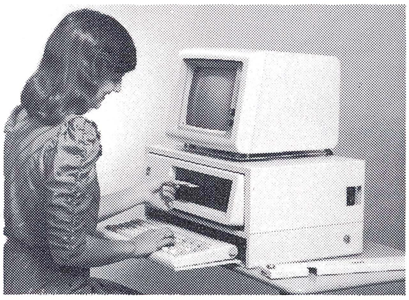

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(those with ASCII values greater than 127) to another device (such as a printer or a computer other than a PC or clone), you may or may not transmit the same characters as you see on-screen. For example, if you use a printer manufactured by Epson that does not have the IBM logo on it, you will probably get Japanese katakana characters instead of the graphics characters displayed on the screen.

With the Ansi.sys device driver installed, you can redirect the scan codes arriving from the keyboard to a lookup table where their meanings can be redefined. This redefinition is accomplished by means of yet another ANSI escape sequence—the last such sequence you'll need to learn:

```
⟨escape⟩[#;#p
```

The two number signs stand for, respectively, the ASCII value of the character you want replaced and the ASCII value of the new character.

For example, if you want the key marked *A* to generate the character *B*, you need to know the ASCII codes for both *A* and *B*. *A* is ASCII 65 and *B* is ASCII 66, so the ANSI escape sequence that makes the *A* key generate the letter *B* is

```
⟨escape⟩[65;66p
```

The best way to try this out—from DOS or from within a batch file—is via the *prompt* command:

```
PROMPT $e[65;66p
```

Follow that with the null:

```
PROMPT
```

to restore the default state of the system prompt. Now, whenever you press *A*, you'll get *B*.

This redefinition affects only the uppercase *A*. Lowercase *a* still produces *a*, and the effect of the *B* key is entirely unchanged. To swap the meanings of both the *A* and *B* keys—in both upper and lower case—simply enter

```
PROMPT $e[65;66p
PROMPT $e[66;65p
PROMPT $e[97,98p
PROMPT $e[98,97p
PROMPT
```

into a batch file. When you activate this batch file, the keys will be remapped. Then, if you like, you can physically remove and switch the keytops for these two keys.

There is a second form of this ANSI escape sequence that allows a single keystroke to generate multiple characters. It looks like this:

```
⟨escape⟩[#;"string"p
```

When this escape sequence is received, the key that represents the ASCII equivalent of # will generate whatever string appears between the two quote marks. For example, a batch file containing the commands:

```
PROMPT $e[65;"Alpha"p
PROMPT $e[66;"Bravo"p
PROMPT $e[67;"Charlie"p
PROMPT $e[68;"Delta"p
PROMPT
```

will cause the *A*, *B*, *C*, and *D* keys to be replaced by the strings *Alpha*, *Bravo*, *Charlie*, and *Delta*.

A more functional (if more complex) use for this facility is to define new meanings for the PC's forty function keys (the F1 through F10 keys in unshifted, shifted, control-shifted, and alt-shifted modes). You have to use a different procedure to enter the codes for the function keys, since they aren't part of the extended-ASCII character set. The method used is to pass to the ANSI driver a 0 as the first parameter in the escape sequence, followed by a number representing the function key. The escape sequence thus looks something like:

```
⟨escape⟩[0;#;#p
```

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or

```
⟨escape⟩[0;#;"string"p
```

In the first example, the first number sign represents the code of the function key in question and the second represents the ASCII value of the character that is to appear when that function key is pressed. In the second example, the # again represents the function key, and the string inside the quote marks is what will be produced by that function key.

The codes for the unshifted function keys are 59 through 68. Therefore, if you want to have the F9 key generate the string *DIR*, you can issue

```
PROMPT $e[0;67;"DIR"p
PROMPT
```

Now, when you press the F9 key, DOS will spell out *DIR* on the command line and wait for you to press the enter key. To put the icing on the cake, you can actually tell DOS to include the carriage return at the end of the *DIR* command. You do this by adding another parameter after the "DIR" portion of the command; this other parameter is 13 (control-M), the ASCII representation for a carriage return. The entire command then would look like this:

```
PROMPT $e[0;67;"DIR";13p
PROMPT
```

The codes you would use to assign strings to the function keys in their various shifted states are as follows:

Keyboard Extended Function Codes (Following 0)

Key	Normal	Shift	Control	Alt
F1	59	84	94	104
F2	60	85	95	105
F3	61	86	96	106
F4	62	87	97	107
F5	63	88	98	108
F6	64	89	99	109
F7	65	90	100	110
F8	66	91	101	111
F9	67	92	102	112
F10	68	93	103	113

This large number of function keys should satisfy even the most discriminating user.

The following sample batch file puts many of the most common DOS commands at your fingertips:

```
COPY CON: SETUP.BAT
PROMPT $e[0;84;"DIR";13p
PROMPT $e[0;85;"DIR/W";13p
PROMPT $e[0;86;"BASICA";13p
PROMPT $e[0;87;"BASICA "p
PROMPT $e[0;88;"COPY "p
PROMPT $e[0;89;"COPY *.* B:";13p
PROMPT $e[0;90;"DATE";13p
PROMPT $e[0;91;"TIME";13p
PROMPT $e[0;92;"CLS";13p
PROMPT $e[0;93;"AUTOEXEC";13p
PROMPT
^Z
```

Of course, you can tailor this list to any set of commands you like. If you are working with a fixed disk, for example, you might want to use the function keys to help you move around your directory tree.

Unfortunately, you're limited to about two hundred bytes for the storage of key redefinitions. If you overrun this space, you don't get any warning from DOS, so you need to use this facility with some caution. In a future article we'll discover how the space limitation can be removed. ▲

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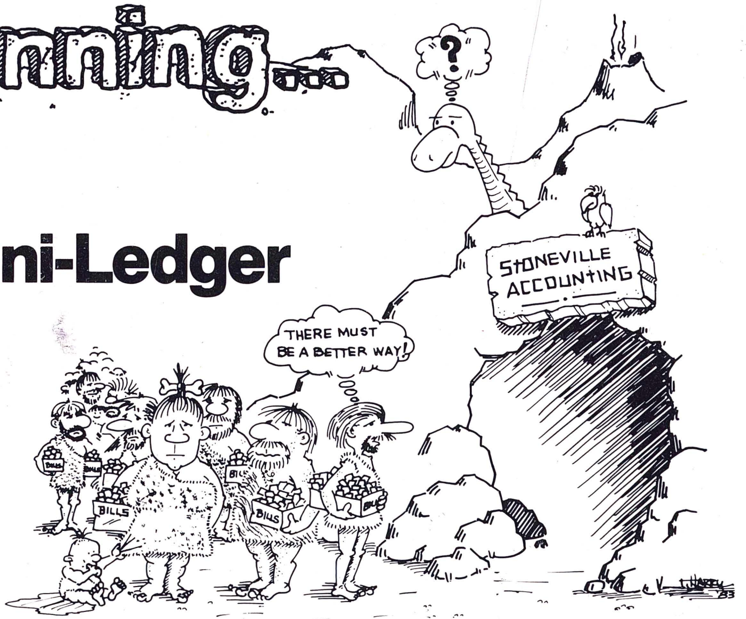

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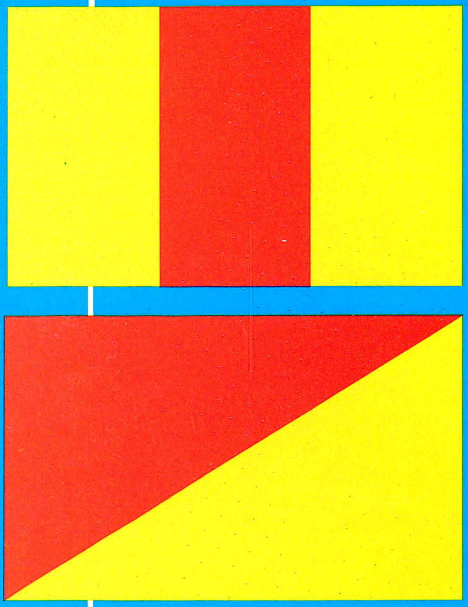

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BY JAMES BRADBURY

Photos by Mike Tighe, Kevin McKeon, and Malcolm Rodgers

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office

The 1984 Olympics may be remembered primarily for the absence of most of the Eastern Bloc. But despite the stay-at-homes, more countries will compete in Los Angeles this summer than have competed in any previous Olympics. The logistics of staging such an event remain overwhelming. Not the least of the headaches facing the Los Angeles Olympic Organizing Committee (LAOOC, pronounced, LAY-ock) will be handling the monumental communication and information needs of the organizers, press, spectators, and, of course, athletes.

By the time the games end, LAOOC will have made about five hundred million photocopies—the stacked equivalent of fifteen Empire State Buildings or, to use a more international example, nineteen Eiffel Towers. The committee will generate 213 tons of electronic mail and five million pages of printed material. In addition, they'll rely on two thousand Telex machines and 250 miles of cable. The goal: instantaneous results and knowledge at the thirty Olympic sites spread over southern California. The idea is not to make this the most computerized Olympics (that was Munich, which many critics felt was overdependent on computers). Instead, LAOOC wants this to be the *best* computerized Olympics—a monument to American technical know-how.

Most of LAOOC's $500-million budget is coming from the private sector in the form of corporate donations and sponsorships. To handle the massive technology needs of the Games, the committee turned to the Communication and Technology Giants. The Giants include MCI, Pacific Bell, Xerox, AT&T, Motorola, and, of course, IBM. Together, these companies contributed more than $50 million of technology in hardware alone, not to mention the time and effort of the people who were loaned to develop and run the hardware.

LAOOC is pleased with the cooperation and teamwork of the Giants. Michael Mount, a LAOOC senior vice president, speaks of a "true Olympic team spirit." He says LAOOC turned down a lot more offers from technological firms than it accepted.

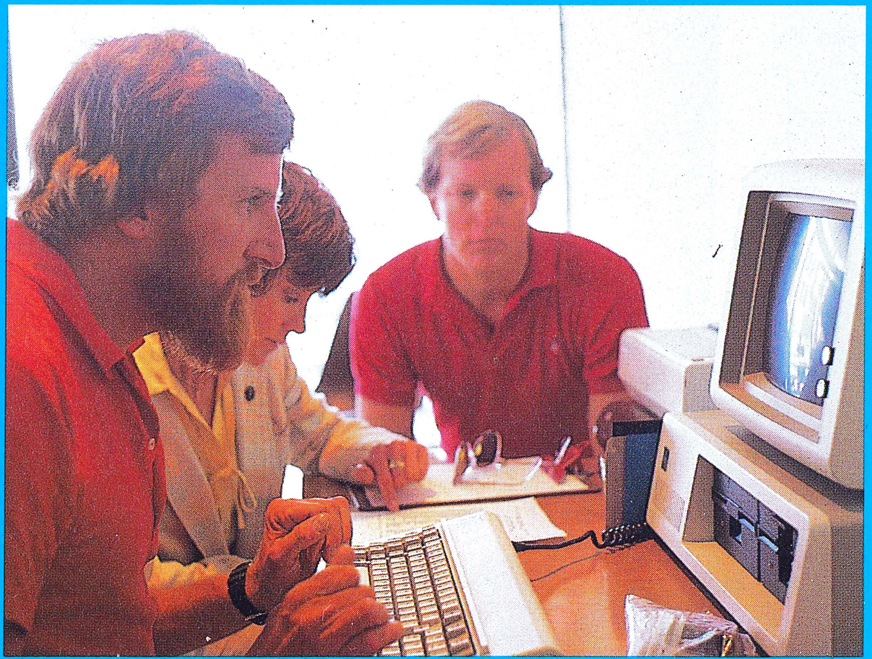
IBM's contribution to the electronic largess consists primarily of 100 PCs, 100 DisplayWriters, and a few System/38s. In addition, McDonnell Douglas has donated time on two of its IBM mainframes. The DisplayWriters are used for word processing in both official Olympic languages, French and English. The more flexible PCs have been applied to everything from planning the Olympic torch relay to organizing a database to catalog children's art submitted for a welcoming airport collage.

Jerold Kotler, a data processing consultant on loan to LAOOC from IBM, says that you'll see *Multiplan* on "every other screen." Other software in use under IBM's aegis includes the PFS series, *EasyWriter*, and *Personal Editor*. Other programs that have found their way in from outside include *WordStar*, *VisiCalc*, *1-2-3*, and *Sailscore*.

The Solings are running before the wind now with their colorful spinnakers unfurled. From a distance, the grace and apparent ease with which the boats move belie the intense competition in progress. Only a few points separate the front-runners; today's sailing will determine which skipper returns to these waters for the Olympics.

Sailscore is the work of one man, both sailor and programmer, Jan Twardowski, who heads the international division of the Frank Russell Company, the country's largest pension fund investment consulting firm. Twardowski learned to program in FORTRAN during the sixties while an undergraduate in electrical engineering at Princeton. A shift in

From the lookout of the yacht club, the finishing order for the day's races is recorded as it comes in over the radio.



Moments after being received, the results are input into Sailscore .

the wind led him to an M.B.A. in finance at the Wharton School.

"In 1968," he remembers, "computers were something that few people had access to, though they were powerful tools. So programming was a facility that was handy."

In 1973, Twardowski was introduced to APL, which since has become his language of choice for all programming.

"APL does seem arcane in the beginning, but after a while you don't even think about it and it becomes completely natural."

The first thing Twardowski attempted in his new language was a yacht-scoring system for regattas. On the face of it, such a system would seem fairly simple, and, in fact, the actual scoring module of Twardowski's program is just five lines of code.

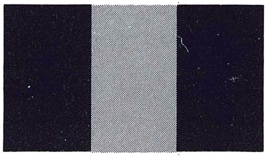
"That's a typical program size in APL," he says. "It's very compact."

Each yacht is assigned a certain number of points based on where it finishes in a race, with the point system weighted to favor boats that finish among the first five. Each competitor drops his worst two scores, so the final point total is based on the yacht's eight best performances. The lower the total number of points a yacht receives during the regatta, the better.

In practice, however, yachting operates under an idiosyncratic tangle of regulations and judgments by juries to settle the protests that invariably are filed after every race. The scoring program must handle a multitude of possibilities. Factors that need to be considered include premature starts, dead heats, materially prejudiced yachts, and disqualifications. The last are especially common.

"In yachting," says Twardowski, "the slightest infraction throws you out." Not unlike programming.

"Ninety-nine percent of the situations that can occur are covered by the program," says Twardowski. "If all else fails because a jury makes a decision that's just out of the range of the system, there's a last fail-safe called 'scoreplug,' where the scorer manually inserts the data into the program at the right spot."



Because Twardowski's scoring program predated the microcomputer era by several years, it originally had to be run on time-sharing mainframes, a situation that precluded its being widely circulated. Nevertheless, it was used in Montreal during the pre-Olympics in 1975 and in the U.S. trials and the Games themselves in 1976, where it ran concurrently with another system.

Twardowski the sailor participated in the U.S. trials that year, too.

"My wife and I sailed a Tornado, which is a twenty-foot catamaran that's faster than hell. It wasn't a big class then," he says, "but, even so, husband and wife teams don't get to go to the Olympics."

After Montreal, Twardowski's sailing program continued to be used in three or four yachting championships a year. In 1980, Twardowski decided that *Sailscore* was finished and gave it to Scientific Time-Sharing (STSC), an APL time-sharing vendor, with the understanding that they would make it available to any yachting club that wanted to use it.

A couple of years later, however, Twardowski was contacted by Rich Kempster of the Alamitos Bay Yacht Club, which was preparing to host the Olympic yachting events in 1984. Kempster was looking for a good computer system to use in the scoring. *Sailscore* was auditioned during the pre-Olympics in Long Beach in 1983. It was then that the PC came into play.

"Last summer, during the boring days of the event," says Twar-

TEN COLUMBIAS JOIN L.A.'S FINEST

Staging an Olympics requires security—lots of security. For the sixty-five law enforcement agencies involved, policing the Games will be an organizational challenge that could easily turn into a nightmare. The Los Angeles Police Department's Olympic Games Planning Group, which is coordinating the effort, is counting on microcomputers to help keep things running smoothly. According to the group's Sergeant Terry Pratt, though, the men in blue won't be relying on Big Blue for their microcomputing hardware.

"We figured we should stay IBM-compatible because we might want to communicate with the Los Angeles Olympic Organizing Committee (LAOOC) or at least exchange some data files," says Pratt, himself a PC owner. "So we went out to bid for an IBM-compatible machine. Because of city regulations, we couldn't specify any particular brand. Columbia won the bid."

The OGPG has ten Columbia PCs, six with hard disks, two with dual floppy drives, and two portables. The primary software programs in use: *1-2-3*, *dBase II*, and *Volkswriter Deluxe*. "We're also using *Smartcom II* for our networking," Pratt says. "We're going to have the micros in the command posts. On a daily basis, when the officers arrive for their shifts, we can generate the rosters for that day. We can record whether they showed up on time, whether they worked overtime, and so on. Overnight, using *dBase II*, we can calculate what that day cost us, because we have to know on a daily basis how close we are to our budget."

The first use to which the machines were put was the planning of command post exercises that simulated a day of the Olympics with all sixty-five law enforcement agencies involved. "Each agency contributed messages they wanted our umpires to send to their actual operators to see how they would handle situations and how well we could coordinate interagency cooperation." *dBase II* was used to keep track of it all.

Since then, the LAPD has used the micros to keep track of the equipment being accumulated in preparation for the Games and to plan the deployment of police officers and civilians. Cost analysis again is a major concern. "We go to our field commanders," says Pratt, "and say, 'Here's your venue; what do you think it will take to secure it properly?' And then we use *dBase* and *1-2-3* to figure out what the cost will be and how close it is to what our budget will allow."

The flexibility of the computers has been a key advantage, and the mercurial nature of the Olympics means that planners will need to make full use of that capability. "We're planning in a vacuum right now with the Eastern Bloc dropout," says Pratt. "It's nice to have machines that can start doing a lot of what-ifs for all the contingencies that are cropping up."

The Columbias represent the first microcomputers that the Los Angeles police have used, apart from a few units previously donated by support groups. One of those units is the PC that the Hollywood vice squad uses to keep track of prostitutes and their aliases. The Columbias were purchased with funds from LAOOC as part of their contract with the police, but when the Games are over they'll remain police property, unlike LAOOC's own PCs, which will be returned to IBM.

What will the Columbias be used for then? Pratt isn't sure. "That decision will probably be made by some assistant chief. They'll probably go under the control of our automated information division, which handles all our mainframe terminals. Maybe they'll create a micro unit."

Perhaps it's just as well that the police will get to keep their machines. "We'd never make it without the computers at this point," says Pratt of the planning effort. "We're spoiled and we're hooked on them." ▲

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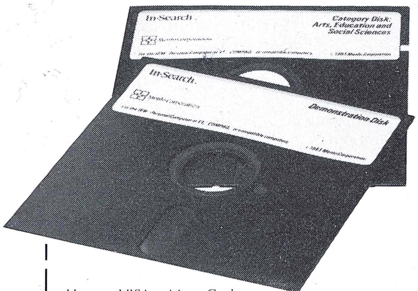

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dowski, "I signed on to STSC and downloaded the whole program onto the PC in an hour. It ran immediately; the only changes I made were minor ones having to do with the screen display and printer output." The program was downloaded onto STSC's *APL*PLUS/PC*. That same year, Twardowski bought a PC. The PC in the Yachting Club was one of the 100 on loan from IBM. During the Olympics, two PCs will handle the scoring.

Twardowski hasn't quite finished with *Sailscore* after all, though.

"Because it's been around so long, the program has no bugs anymore," he says, "except for ones that I introduce myself when I make minor changes, and those have been pretty easy to fix. Right now, I'm working on making the program more user-friendly by making it menu-driven. The most important thing is to make it very hard for a user to make an error in data entry." This is particularly critical because during the hectic Games this summer the people running the program won't be as familiar with it or the PC.

How much of a difference will *Sailscore* make? As with other sports where the PC is used to aid in scoring—gymnastics, swimming, diving, archery, shooting, fencing, and boxing—the advantage is not so much improved accuracy as increased speed. With *Sailscore*, skippers can expect to see a summation of their unofficial standings (before the protests) by the time they sail back into the marina. Previously, there was a long wait while judges laboriously hand-compiled the statistics. Everyone from the yachting press to the people who answer the yachting club's telephones swears by the neatly printed reports.

And come August 13 when the Games are over and the PCs and DisplayWriters return to IBM, what will become of *Sailscore*?

"The United States Yacht Racing Union has been looking for some good software," says Twardowski. "If they're interested, I may produce a version to be sold at cost and distributed among yacht clubs. The idea is to make it available. STSC has tentatively agreed to release a special version of its APL, so that users can just get the disk and boot it without having to run APL separately."

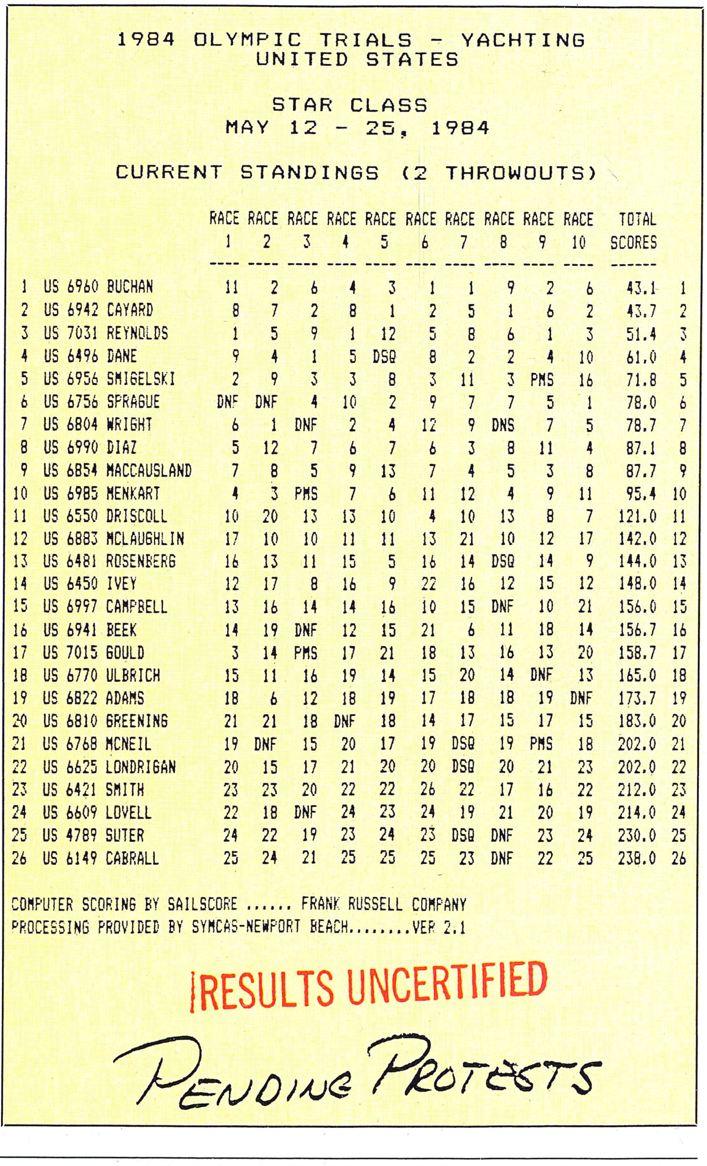
The PC stationed at the Alamitos Bay Yacht Club will go back to LAOOC and ultimately to IBM, but the club already has installed its own PC. The machine currently is being used for billing, but there's no reason it couldn't one day also run *Sailscore*. The LAOOC PC has already been put to work allocating gas and slip spaces to competitors. What's happened in yachting probably holds true for the other Olympic sports: The role of the microcomputer won't disappear with the Olympics. An awareness of how micros can enhance organized sports will remain.

In spite of the multimillion-dollar teamwork of IBM and the other technological Giants on behalf of the Olympics, it would be a hollow technical triumph if one couldn't point to gifted amateurs like Jan Twardowski, whose contributions come solely out of love for a sport.

"It's my favorite thing that I've done in programming," says Twardowski of *Sailscore*. "In my field there are a lot of applications for computers, and I've done a lot of stuff like that, but to make a contribution that helps a sport I love is very satisfying."

To reach the finish line, the Solings must sail into the wind, so they approach it from a sharp angle and then one by one whip around the marker buoy. The order of finish is radioed back to shore, where the results are tapped into the PC. A short while later, the Stars cross the line, and the process is repeated. Out come the results. In the Star class, the victor has won by a margin of less than a point. In both classes, the men who have earned the right to represent the United States are the same ones who won the trials in 1980, a year when the U.S. did not compete. This year, however, they'll get their chance to win the gold. And the PC will be waiting. ▲

The Olympic hopefuls in Alamitos Bay prepare their yachts for a day at the races.



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              1984 OLYMPIC TRIALS - YACHTING
                      UNITED STATES

                       STAR CLASS
                   MAY 12 - 25, 1984

           CURRENT STANDINGS (2 THROWOUTS)

                            RACE RACE RACE RACE RACE RACE RACE RACE RACE RACE   TOTAL
                              1    2    3    4    5    6    7    8    9   10   SCORES
                            ---- ---- ---- ---- ---- ---- ---- ---- ---- ----  ------

 1  US 6960 BUCHAN           11    2    6    4    3    1    1    9    2    6    43.1   1
 2  US 6942 CAYARD            8    7    2    8    1    2    5    1    6    2    43.7   2
 3  US 7031 REYNOLDS          1    5    9    1   12    5    8    6    1    3    51.4   3
 4  US 6496 DANE              9    4    1    5  DSQ    8    2    2    4   10    61.0   4
 5  US 6956 SMIGELSKI         2    9    3    3    8    3   11    3  PMS   16    71.8   5
 6  US 6756 SPRAGUE         DNF  DNF    4   10    2    9    7    7    5    1    78.0   6
 7  US 6804 WRIGHT            6    1  DNF    2    4   12    9  DNS    7    5    78.7   7
 8  US 6990 DIAZ              5   12    7    6    7    6    3    8   11    4    87.1   8
 9  US 6854 MACCAUSLAND       7    8    5    9   13    7    4    5    3    8    87.7   9
10  US 6985 MENKART           4    3  PMS    7    6   11   12    4    9   11    95.4  10
11  US 6550 DRISCOLL         10   20   13   13   10    4   10   13    8    7   121.0  11
12  US 6883 MCLAUGHLIN       17   10   10   11   11   13   21   10   12   17   142.0  12
13  US 6481 ROSENBERG        16   13   11   15    5   16   14  DSQ   14    9   144.0  13
14  US 6450 IVEY             12   17    8   16    9   22   16   12   15   12   148.0  14
15  US 6997 CAMPBELL         13   16   14   14   16   10   15  DNF   10   21   156.0  15
16  US 6941 BEEK             14   19  DNF   12   15   21    6   11   18   14   156.7  16
17  US 7015 GOULD             3   14  PMS   17   21   18   13   16   13   20   158.7  17
18  US 6770 ULBRICH          15   11   16   19   14   15   20   14  DNF   13   165.0  18
19  US 6822 ADAMS            18    6   12   18   19   17   18   18   19  DNF   173.7  19
20  US 6810 GREENING         21   21   18  DNF   18   14   17   15   17   15   183.0  20
21  US 6768 MCNEIL           19  DNF   15   20   17   19  DSQ   19  PMS   18   202.0  21
22  US 6625 LONDRIGAN        20   15   17   21   20   20  DSQ   20   21   23   202.0  22
23  US 6421 SMITH            23   23   20   22   22   26   22   17   16   22   212.0  23
24  US 6609 LOVELL           22   18  DNF   24   23   24   19   21   20   19   214.0  24
25  US 4789 SUTER            24   22   19   23   24   23  DSQ  DNF   23   24   230.0  25
26  US 6149 CABRALL          25   24   21   25   25   25   23  DNF   22   25   238.0  26

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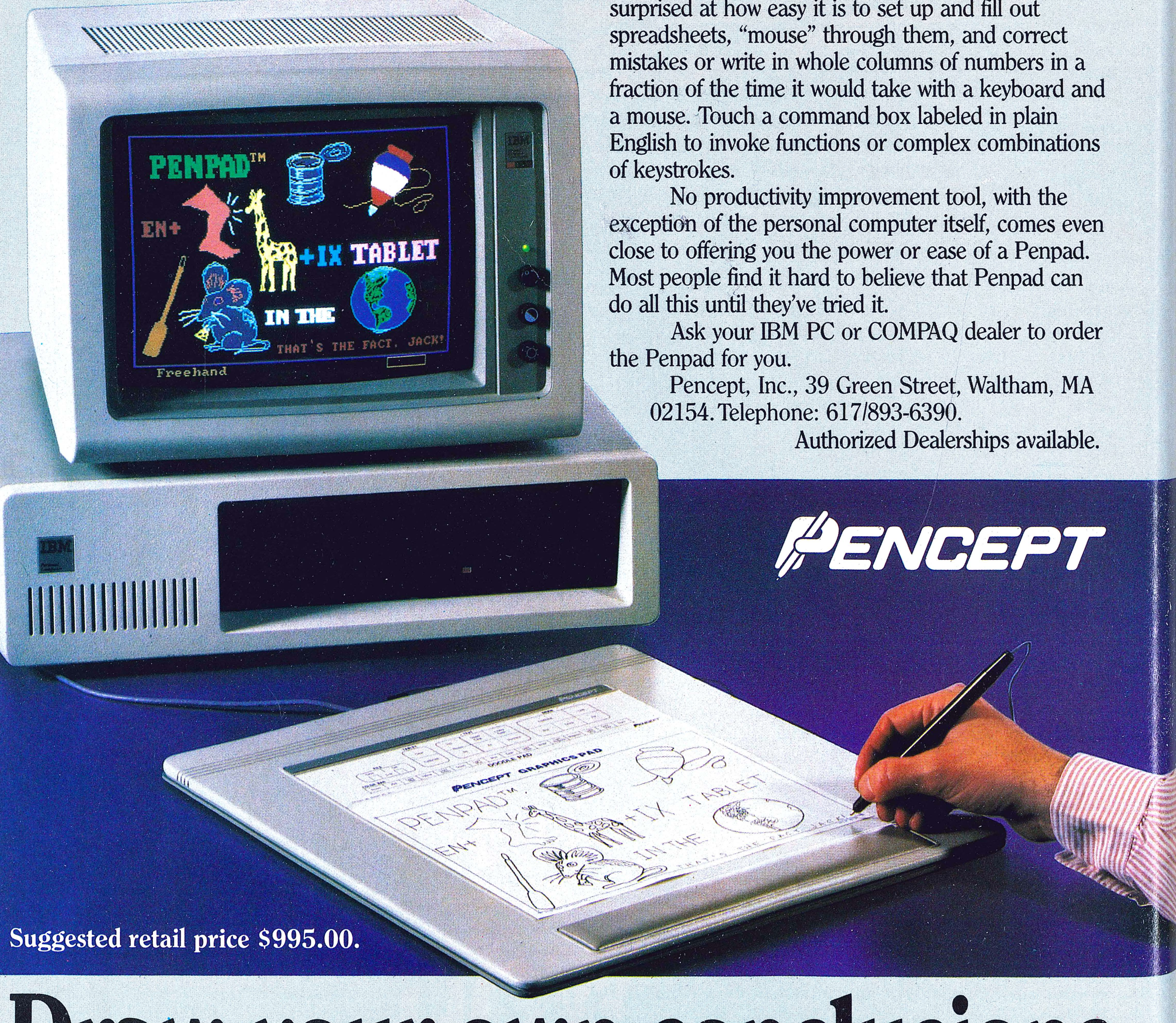

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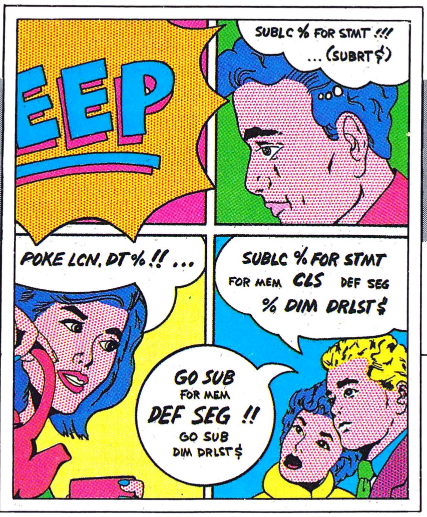
EEP
SUBLC % FOR STMT !!! ...(SUBRT$)
POKE LCN.DT% !! ...
SUBLC % FOR STMT FOR MEM CLS DEF SEG % DIM DRLST$
GO SUB FOR MEM DEF SEG !! GO SUB DIM DRLST$

BASICALLY SPEAKING

by John Dickinson

More Basic Car Care

Last time we left off with a serviceable but somewhat limited Basic Car Care program that computes gas mileage and checks to see whether your car's performance is above, below, or equal to a standard value. The program, as we left it, is not seriously limited, but it only works for two tanks of gas, and it's designed specifically for use with a new car.

We suggested that you try to overcome both of those limitations by changing the program around. Did you try it? How'd it work out?

Let's see how easily the program can be changed. It currently looks like this

```
5 DATA 239, 18.3
6 DATA 537, 18.2
10 FOR FILLUPS% = 1 TO 2
20 READ NEW.ODOMETER!
30 READ GALLONS.LOADED!
40 LET MILES.DRIVEN! = NEW.ODOMETER! -
   OLD.ODOMETER!
50 LET GAS.MILEAGE! = MILES.DRIVEN! /
   GALLONS.LOADED!
60 PRINT GAS.MILEAGE!
70 IF GAS.MILEAGE! = 15.5 THEN PRINT "Performance is
   standard"
     ELSE IF GAS.MILEAGE! > 15.5 THEN PRINT
     "Performance is above standard"
        ELSE PRINT "Performance is below standard"
80 LET OLD.ODOMETER! = NEW.ODOMETER!
90 NEXT FILLUPS%
```

When you run the program, this is what you get on your screen:

```
13.06011
Performance is below standard
16.37363
Performance is above standard
```

The program's *data* statements contain the data for each tankful of gas, and the *read* statements assign that data to Basic variables. (If you're not familiar with the way *data* and *read* statements work, be sure to look at last month's column.) The odometer reading is read and assigned to the variable New.odometer!, and the amount of gasoline taken on is read and assigned to Gallons.loaded!.

Our Car Care program computes the values of the variables Miles.driven! and Gas.mileage!, then *prints* (displays) Gas.mileage!. It uses *if* statements and relational operators to determine how Gas.mileage! performance compares with our "sticker" standard of 15.5 miles per gallon and to report the results in *print* statements that are part of the *then* and *else* clauses of the *if* statements. The second *if* statement is also part of an *else* clause.

Most of the work done by the Car Care program is executed inside a Basic *for* loop. The loop's counter, Fillups%, is set in the *for* statement to allow the program to go through everything twice, once for each tank of gas.

How might we change the program so it works for more than two tanks of gas, and so it works for an older car? Let's start by adding a new *data* statement containing information about another fill-up:

```
7 DATA 810, 17.3
```

This new *data* statement looks much like the others, except it contains different data. We've made it line number 7 so that it will come after the other *data* statements and therefore be read last. All we have to do to make the program use the new data is change the *for* statement so the counter stops the loop after the program has processed three (rather than two) Fillups%—like this:

```
10 FOR FILLUPS% = 1 TO 3
```

Now if you run the program, your output will show the Gas.mileage! for the third tank too and tell you how this mileage rated against the 15.5 standard.

Not surprisingly, there's a better way to do the same thing. Last month we saw that *data* statements can be placed anywhere and read anywhere but that it's best to keep all the *data* statements in one place (we've put ours at the start of the program). To make your program operate correctly, however, you may need to put *read* statements in many places. What we're about to do is a case in point.

The better way to change the number of Fillups% that our program processes is to arrange things so that the number of Fillups% is an additional data input item. Once again we'll use a new *data* statement to express the number of tankfuls, and then we'll change the program in such a way that it reads this number-of-tankfuls information before starting its *for* loop. We'll also change the *for* statement in line 10 so that it uses the number of Fillups% as read from the *data* statement to control the number of times the loop is executed.

So, add this *data* statement

```
4 DATA 3
```

which contains the number of fill-ups (three) we want the program to process. Now, add a *read* statement in line 9 to read the new *data* statement and assign the value it contains to a new variable, called Num.fillups%:

```
9 READ NUM.FILLUPS%
```

Then change the *for* statement in line 10 to use the new variable:

```
10 FOR FILLUPS% = 1 to NUM.FILLUPS%
```

When you run the program now, you'll see the same output as last time because the program's actual logic and data have not changed. The program has become more flexible, however. The way the program is now set up, all you have to do to have it analyze an additional tankful is change the first *data* statement to reflect the number of tankfuls and add a new *data* statement containing the odometer reading and gallons of gas loaded. You could just as easily reverse the process (to make the

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program analyze fewer tankfuls) by deleting one of the *data* statements and changing the first one to remove a fill-up.

What we've been using here is a standard programming technique that you will find even handier as you learn other ways to enter data into Basic programs. This technique allows us to have Basic read a program parameter (Num.fillups%) from a data input source (in this case the *data* statement) and lets that parameter control operation of the program. As you'll see, allowing a data value, instead of a constant value, to control the program gives the program's user (you, in this case) more flexibility in how the program functions. Just imagine what things would be like if your word processor insisted on a fixed number of lines per page or your spreadsheet program worked only with ten columns per analysis.

We can change the program to work with an older car in much the same way. So far we've been depending on Basic to set a starting value of 0 for Old.odometer! whenever we've run the program (remember, Basic clears all variables to 0 before it starts running a program, and we've been depending on Old.odometer! to start there). All we have to do to use the program with an older car is tell Basic to start with a different value for Old.odometer!; and we can do that by adding yet another *data* statement

```
3 DATA 237
```

and another *read* statement, this one in line 8:

```
8 READ OLD.ODOMETER!
```

If you read last month's installment, you might remember that 239 was the odometer reading the first time we refilled the tank of our new car. Now let's change the program to work for just the second and third fill-ups of our new car (in other words, let's now treat our new car as an old car). To do this, edit line 4 to make it read

```
4 DATA 2
```

thereby setting Num.fillups% to 2. Then delete the *data* statement in line 5 (you can do that by typing *delete 5* or simply by typing *5* and hitting return).

The next time you run the program, you'll get what are now familiar-looking results (for our new car). If you haven't yet tried it out for your own car, do it now. Just enter the correct starting odometer reading in line 3, the number of fill-ups you're using in line 4, and the correct data in lines 4, 5, and so on.

Our Car Care program is getting to look pretty messy. Basic's built-in editor provides ways to help you clean things up.

Basic's most powerful program reorganization command is *renum*, which stands for *renumber. Renum* evens out the line numbers for you. It's a powerful command, but it can be difficult to use, so be prepared to reload your program from disk if you happen to make a mistake. And, of course, save the current version before you go any further so you're prepared for the worst. Remember, too, it's always a good idea to keep a running backup copy of your Basic program disk.

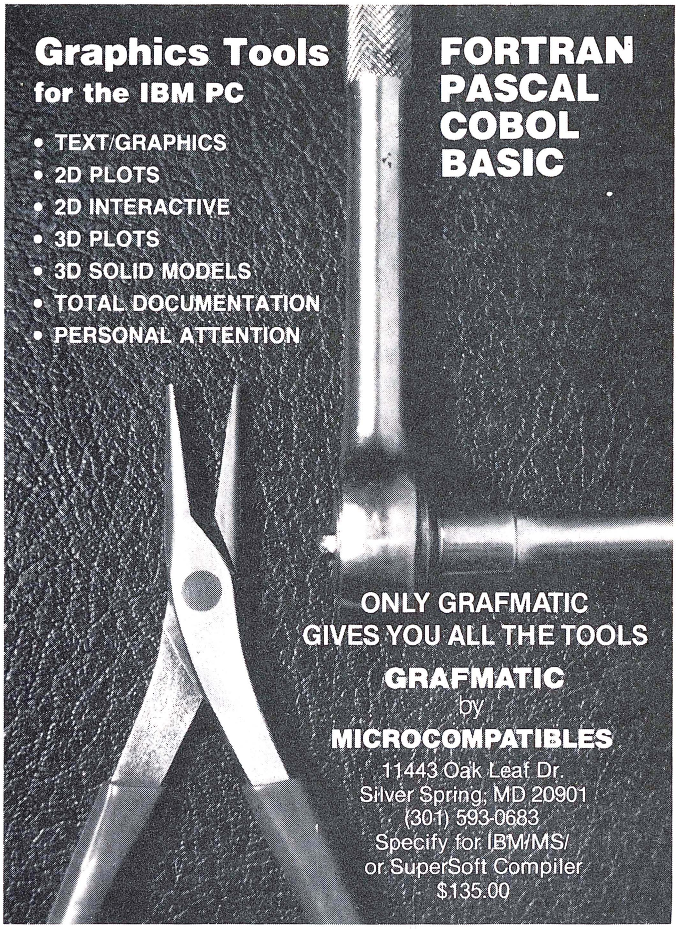
The easiest way to use the *renum* command is to type

```
renum
```

If you do this and then list your program, you'll see that the program has been renumbered so that the first line number is 10 and successive line numbers increment by 10. Your program lines should now be at equal intervals, just the way they were when you first entered the program by means of Basic's automatic input mode.

This is the standard way that *renum* works, but it isn't the only way. It's common practice to number program lines at even intervals of 10, but sometimes it's more convenient to do otherwise; our Car Care program is a case in point. Since we'll be adding many more tanks of gas, we'll need more room at the beginning of the program so we can add *data* statements. There's a way that *renum* can help us do that.

To get the room we want, let's have the *data* statements begin at line 10 and the body of the program, starting with the first *read* statement, begin at line 1000 (many Basic programmers wouldn't think of starting their programs at any other line number). After that, whenever we



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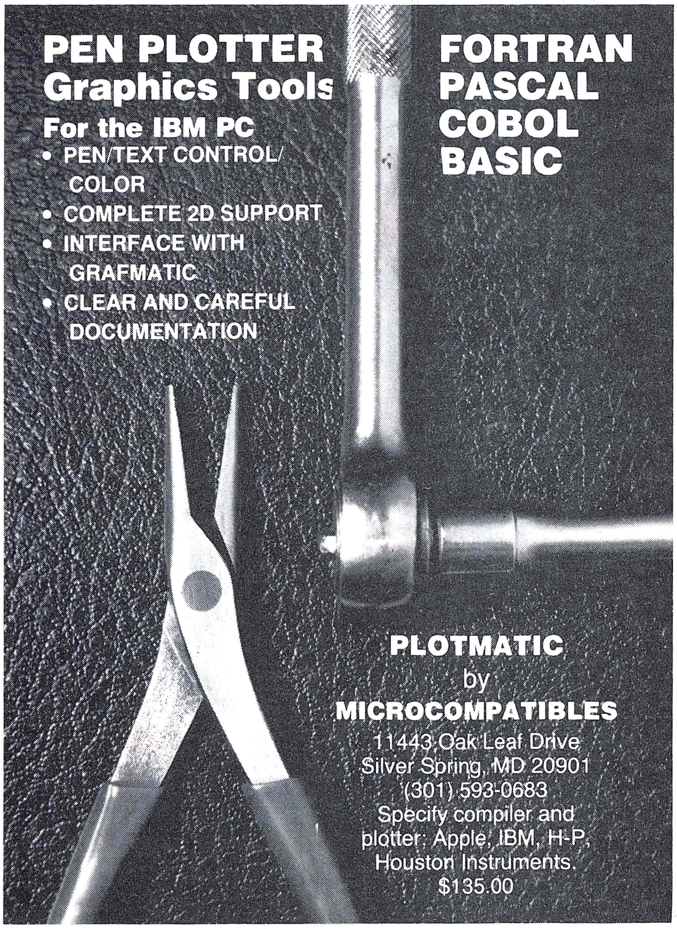

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need to add another *data* statement we can just make up a nice round line number that's less than 1000.

If you have used *renum* as suggested, your first *read* statement is in line 50; that's the statement we'd like to see in line 1000. If you've made other changes to your program, the first *read* statement is probably in some other line and you'll have to adjust the following instructions to compensate.

We can ask *renum* to do its work starting at line 50 instead of at the beginning of the program. We'll have it change line 50 to line 1000 and then increment the rest of the line numbers by 5 (instead of by 10).

```
renum 1000, 50, 5
```

In general, the *renum* command uses the following format:

```
renum {newnum}, {oldnum}, {increment}
```

where {*newnum*} is the new starting line number you want to use, {*oldnum*} is its current number, and {*increment*} is what you want added to each line number. You can omit any of these values if you want, but be careful. If you want to omit {*oldnum*}, you must put two commas in, like this:

```
renum {newnum}, , {increment}
```

The extra comma tells BASIC to ignore the {*oldnum*} value and start renumbering at the beginning of the program. If you leave out the {*increment*} value, BASIC increments by ten. Experiment with the *renum* command until you're comfortable with it, but be sure to make backup copies of your programs before you start.

When you're done renumbering, your program will look like this:

```
10 DATA 237
20 DATA 2
30 DATA 537, 18.2
40 DATA 810,17.3
1000 READ OLD.ODOMETER!
1005 READ NUM.FILLUPS%
1010 FOR FILLUPS% = 1 TO NUM.FILLUPS%
1015 READ NEW.ODOMETER!
1020 READ GALLONS.LOADED!
1025 LET MILES.DRIVEN! = NEW.ODOMETER! -
     OLD.ODOMETER!
1030 LET GAS.MILEAGE! = MILES.DRIVEN! /
     GALLONS.LOADED!
1035 PRINT GAS.MILEAGE!
1040 IF GAS.MILEAGE! = 15.5 THEN PRINT "Performance
     is standard"
       ELSE IF GAS.MILEAGE > 15.5 THEN PRINT
       "Performance is above standard"
         ELSE PRINT "Performance is below standard"
1045 LET OLD.ODOMETER! = NEW.ODOMETER!
1050 NEXT FILLUPS%
```

Now we have plenty of room to add more data. Let's start by adding a 0 data item in line 10:

```
10 DATA 0
```

Doing this converts our program back to its original, new-car tracking function. Then we can put in some new *data* statements to reflect our next couple of tankfuls.

The data for our car now looks like this:

```
20 DATA 5
30 DATA 237, 18.3
40 DATA 537, 18.2
50 DATA 810, 17.3
60 DATA 1040, 14.5
70 DATA 1297, 16.2
```

Notice that, because we left so much room in the line numbers between

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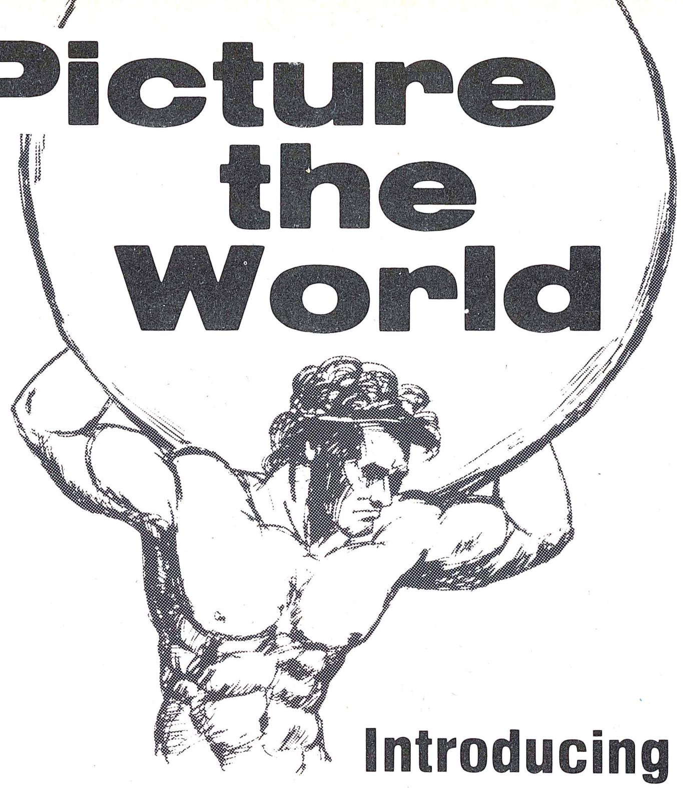

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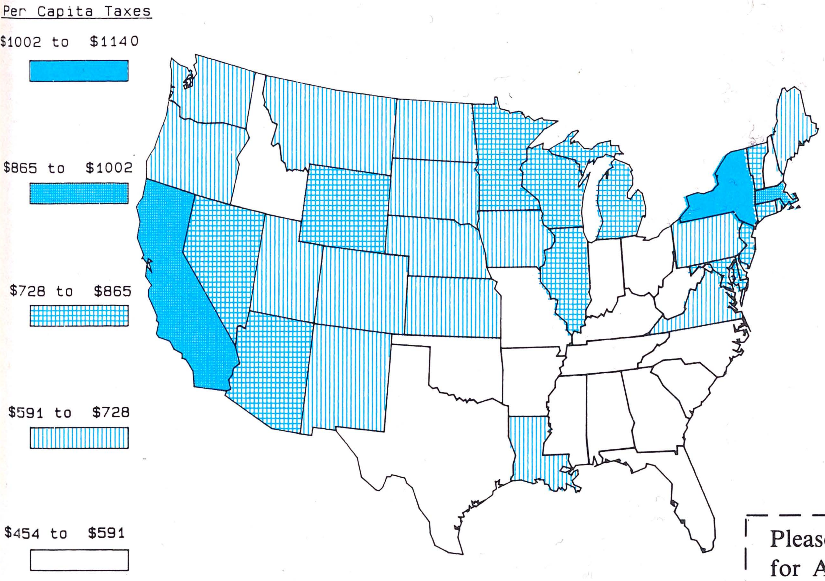

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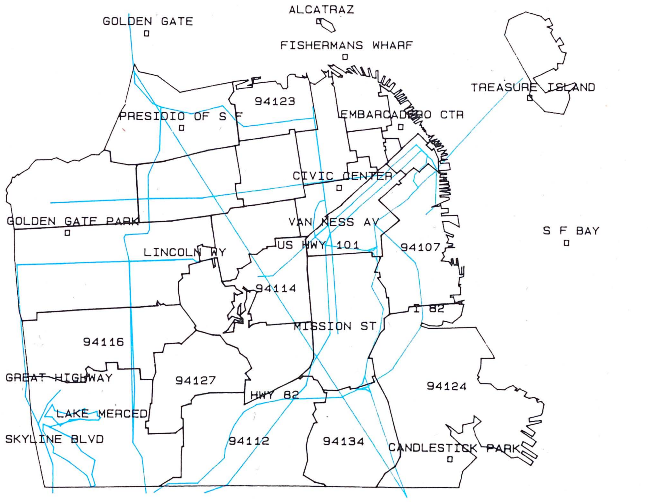

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the *data* statements and the rest of the program, we can add many more fill-ups to the program before we'll have to reorganize it.

There are more ways we can enhance the Car Care program's capability, but at the end of last month's column we promised we would provide better-looking output for this program, and it's about time we paid some attention to that.

Let's start by changing the *print* commands in the program so that all the output for each fill-up is displayed on a single line. The way the program works now, the Gas.mileage! display and its accompanying performance message appear in two lines. That happens because, unless you tell it to do otherwise, BASIC automatically skips to the next display line after executing a *print* command.

Telling BASIC not to skip to the next line is so easy that you'll wonder why we didn't cover it before. Just add a semicolon to the end of the *print* statement, like this:

```
1035 PRINT GAS.MILEAGE!;
```

When you run the program now, the output for each fill-up will be in one line, like this:

```
13.06011 Performance is below standard
16.37363 Performance is above standard
15.78035 Performance is above standard
15.86207 Performance is above standard
15.8642 Performance is above standard
```

So far, so good—not bad for just changing one character in one statement. What else can we do to clean up the Car Care program's output?

Well, for one thing it doesn't look too professional to have the words "Performance is . . . etc." appear on every line without at least some indication of what kind of performance is being reported. That's easy enough to fix. We'll just add another *print* statement that displays "MPG" as a character constant. We'll need to use another semicolon (to keep everything on one line), so enter the new statement this way:

```
1035 PRINT GAS.MILEAGE!;
1037 PRINT " MPG ";
```

Notice the extra space at each end of the constant. That's a quick way to make sure there will be a space between "MPG" and other items displayed in the same line.

Another thing we can do is eliminate the word "Performance" from each of the messages displayed in line 1040. Even though this removes some information, go ahead and do it now; you'll learn a nice way to restore the lost information later. If you use the delete key to remove text, you'll notice BASIC's editor slowly pulling the whole line backward. It's easier (and faster) in a case like this just to retype the message, instead of trying to edit it. When you're done, the statement should look like this:

```
1040 IF GAS.MILEAGE! = 15.5 THEN PRINT "standard"
          ELSE IF GAS.MILEAGE > 15.5 THEN PRINT "above
          standard"
            ELSE PRINT "below standard"
```

Your output should look a little better now, something like this:

```
13.06011 MPG below standard
16.37363 MPG above standard
15.78035 MPG above standard
15.86207 MPG above standard
15.8642 MPG above standard
```

Unless you're the type of person who makes note of all five digits to the right of the decimal point on the newer electronic fuel pumps, you probably don't need all the decimal places the Car Care program prints for Gas.mileage!. Last month we learned that we could get rid of all the digits by just replacing a real variable with an integer variable, but we'd like to see some of these digits in our results. We'd also like BASIC to use all the digits in its calculations so that comparisons of Gas.mileage! to our standard mileage figure will be accurate (this will become even more important later).

Rather than use integer variables, let's tell BASIC to print only the first two digits to the right of the decimal point. We can do that by drawing a picture of the numeric format we want BASIC to use when printing Gas.mileage! and then changing the program to have BASIC *print using* the picture. As you'll soon see, we will even out the lines a little at the same time.

First, the picture. BASIC understands pictures of numbers that are drawn with pound signs (#) and decimal points. Each pound sign in the picture represents a digit and tells BASIC to display a number's digit in that position. The decimal point (only one is allowed per picture, but any number of pound signs may be used) indicates to BASIC where you want the decimal point placed when the number is printed. Since BASIC understands pictures only if you treat them as characters, we have to draw our picture inside quote marks.

Pictures are a little difficult to understand the first time you try them, so try an example in immediate mode (save the current version of your program first). Start by assigning some variable an arbitrary number:

```
let x! = 98.92367
```

If you just *print* this variable

```
print x!
```

you'll get exactly what you input:

```
98.92367
```

If you wanted to print only two digits to the left of the decimal point and just one digit to the right, you could tell BASIC to *print using* a picture, like this:

```
print using "##.#"; x!
```

This time you'll get

```
98.9
```

displayed on your screen. The semicolon after the picture (the part in-

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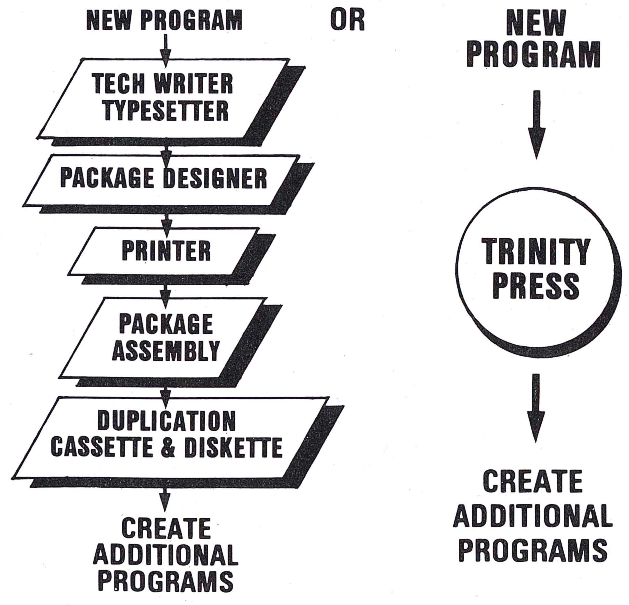

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side quote marks is the picture) is required; you'll get a syntax error if you omit it.

If you aren't sure how many digits a number has to the right of the decimal point but want to be sure to see them all, you could try *using* a long picture, like this:

```
print using "##.################"; x!
```

which would give you

```
98.9236700000000000
```

You can add digits to the left, but Basic will fill the extra spaces with blanks instead of with zeros, as it does on the right:

```
print using "########.###"; x!
           98.923
```

There are other things you can put in a numeric picture (for example, you can have Basic insert dollar signs), but we'll get to them later. One other rule you should learn now, though, is that there can only be one *using* option per *print* statement and that the picture in it will apply to all items printed. If more than one picture format is required, you have to use more *print* statements.

Let's see if we've learned enough to make our output look better. Use a picture, along with the single-line display, in your *print* statement:

```
1035 PRINT USING "##.##"; GAS.MILEAGE!;
```

That gets rid of excess digits on-screen without sacrificing them internally (as we would have if we'd converted to integer variables); in other words, what you see notwithstanding, the Gas.mileage! variable still has all seven digits. As an added bonus, the items line up more evenly, because all the Gas.mileage! outputs are in exactly the same format.

Everything we've printed up till now has started out all the way over on the left of the screen and looks a bit crunched up as a result. Basic has an easy command to tabulate screen output, a command that works much like a tabulation feature in a word processor or the tab key on a typewriter. The *tab* command is inserted in a *print* statement in much the same way as a *using* command (it even requires a semicolon), but there's an important difference. Whereas the *using* command requires you to draw a picture specifying the display spacing you want *print* to use, *tab* requires that you use an ordinary integer to indicate the display position to which you want to tab. This integer can be either a constant or a variable.

Tab is what's called a Basic *function*. A function is a separate program you can ask Basic to run. The number of spaces you tell the *tab* command to use is called a function *parameter* or *argument*. Function arguments are usually enclosed in parentheses.

In *tab*'s case, the command to use the function winds up looking like this:

```
TAB({argument})
```

The argument for *tab* specifies the screen column to which you want Basic to move to before printing.

Let's give the *tab* command a quick whirl in immediate mode. Try tabbing over fifteen spaces and displaying a constant, like this:

```
print tab(15); 55.6677
               55.6677
```

Another difference between *tab* and *using* is that you can use any number of *tab* commands (within reason) in the same print statement. Try this out:

```
print tab(15); 55.6677; tab(30); 98.0982
               55.6677        98.0982
```

The *tab* function can be used *only* within a *print* statement (where other functions can be used depends on how they're used). Unlike *tab*, other Basic functions can have more than one argument (the multiple arguments are usually separated by commas). You'll be using several different Basic functions as we move along, so you'll get used to the

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idea of passing information—in the form of arguments—to a function.

Although BASIC usually doesn't mind extra spaces in statements, it will not tolerate spaces between many of its built-in functions and the parentheses that surround those functions' arguments. This isn't true of all BASIC functions, but, to be on the safe side, avoid using a space between a function keyword and the left parenthesis that follows.

We want BASIC to move five spaces to the right before displaying the output for Gas.mileage!, so modify your *print* statement to look like this:

```
1035 PRINT TAB(5); USING "##.##"; GAS.MILEAGE!
```

When you run the program, you should notice that the *tab* command pushes the remainder of the line to the right. BASIC prints at the next available space unless you use a *tab* command (or another method) to tell it to do otherwise.

We lost some information before when we removed the words "Performance is" from our *print* statements. We can get that information back and at the same time make our screen display look even nicer by printing some program and column title lines at the top of our output. Let's do the column titles first.

If we look at the first two *print* statements,

```
1035 PRINT TAB(5); USING "##.##"; GAS.MILEAGE!
1037 PRINT " MPG ";
```

or their output

```
13.06 MPG below standard
16.37 MPG above standard
15.78 MPG above standard
15.86 MPG above standard
15.86 MPG above standard
```

we see that the display's character positions are used in the following way:

Character columns	Item printed
1 through 4	Blank
5 through 9	Gas.mileage!
10 through 14	" MPG "
15 through 28	Performance message

Using this information, along with *tab* commands and character constants, we can produce an additional *print* statement that will put title information over the output columns. We don't have to align each item with its own title because, in this case, Gas.mileage! and " MPG " are really one item that we'll label "Mileage." We'll label the other item "Performance."

Just add the following *print* statement above the *for* statement in line 1007:

```
1007 PRINT TAB(5); "Mileage"; TAB(15) "Performance"
```

Notice that we didn't use a semicolon at the end of this *print* statement. This time we want to be sure that BASIC *does* skip a line before printing the rest of our output. If you run the program now, you'll see that the "Mileage" title is not quite centered over the output. You can fix it by "padding" the constant with two blanks, like this:

```
1007 PRINT TAB(5); "  Mileage"; TAB(15) "Performance"
```

or by changing the first *tab* command, like this:

```
1007 PRINT TAB(7); "Mileage"; TAB(15) "Performance"
```

Either way you do it, the "Performance" title will show up in the same place because the second *tab* command forces it to start in character position 16—regardless of where "Mileage" may be printed.

We'd also like the program's entire output to have a title; doing that is even easier. Add the following *print* statement:

```
1006 PRINT TAB (5); "BASIC Car Care Program"
```

This will work just fine, but to make our screen display even nicer, let's ask BASIC to clear the slate before printing anything.

You can modify the *print* statement by adding a second command to it. To clear the screen, add your old friend *cls* to the *print* statement. Change line 1006 to look like this:

```
1006 CLS: PRINT TAB(5); "BASIC Car Care Program"
```

The colon allows you to put more than one BASIC statement in a program line. This trick works for any type of command and can be used to put any number of statements in a single line, so long as the total line length doesn't exceed 255 characters (a little more than three display lines).

Be careful when putting more than one statement in a line, however. It sometimes makes the statements in the line difficult to read, and this can make it hard for you to understand what your program is doing. Debugging a program can get to be a nightmare if you overload your program lines.

Next month we'll figure out how to compute the car's overall gas mileage average, and we'll use that as a second type of standard by which to measure performance. It will require some changes in the program and require you to learn some important new concepts, so be sure to tune in.

In the meantime, see if you can modify the CarCare program to print the odometer miles (the New.odometer! variable) on each output line.

See you next month. ▲

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KEEP A CLOCK ON YOUR MONITOR

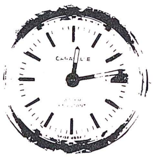
BY STEVEN HOLZNER

Have you ever become so absorbed at your PC that you've lost track of the time? If so, perhaps you'd appreciate having an unobtrusive little clock on your screen. This article presents a clock that sits handily in the upper right corner of your screen; with it, you can check the time whenever you wish and during whatever you're doing or running.

The clock arrives on-screen by way of an assembly language program (a .com file), called Clock.com, that you can add to an Autoexec batch file if you wish. Clock.com attaches itself to DOS, so it'll be with you no matter what subdirectory you go to; and it does its work without bothering (much) any other programs you may be running (messages sent by your application program to the upper right corner of the screen will be overwritten by Clock.com; but unless you do a lot of work in that region, you won't be inconvenienced much).

To create Clock.com, type in and run Clock.bas, the Basic program listed in figure 1 (you only have to run the Basic program once). Clock.com itself is all the numbers you see in the Basic *data* statements (line numbers 210 through 540); all the Basic program does is open a file called Clock.com, read the numbers into it (any .com program is just a file of numbers representing coded instructions to the 8088), and then close the file.

When you run Clock.bas, it creates Clock.com. Clock.com is all you need. When you run Clock.com (by typing *clock* at the DOS prompt), you'll have a screen clock that will remain until you reboot.



Just What Time Is It? High on the list of things Clock.com must do is find out what time it is. Inside the PC is a timer chip (an 8253, to be specific) that increments a memory location once every .0549254 seconds (give or take)—or about 18.206 times per second. This seems like quite an exotic number, picked surely for the convenience of the manufacturer, not for that of the programmer who wants to calculate the time of day.

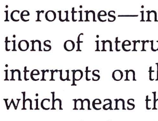
It would appear that to find the time we have to take this count and divide by 18.2 (give or take) to get seconds and then again by 60 to get minutes and then yet again by 60 to get hours. Assembly language programmers have a sizable fear of dividing, which, on the 8088, takes about fifty times as long as adding; hence the prospect of all that division is unpleasant.

Happily, it's unnecessary. 18.2 counts per second means 65,536, or two to the sixteenth, counts per hour (most timer or clock chips used in microprocessor systems have some respect for the hours-minutes-seconds system, if for no other reason than to generate transmissions between systems at multiples of one character per second). The timer count is held in two memory locations in the BIOS data storage area, segment 40. This segment is where BIOS stores all it knows about the present state of the PC, including such things as whether the shift-lock key has been pressed and the status of the various keyboard toggles. The two locations used for the timer are 0040:006C (low word) and 0040:006E (high word). Since each word is sixteen bits, each word can hold any number from 0 through 65535. At 65535, the count looks like this—0000:FFFF; as soon as the count reaches 65536, a 1 gets pushed into the high word, like this—0001:0000. It takes an hour, therefore, to push a 1 into the high word (0040:006E) of the timer count. This fortunate circumstance saves us some algebra, since it means that the number in 0040:006E is exactly the number of hours gone by.

You can use Debug to check this fact directly. Type *debug* at the DOS prompt and, when you get Debug's hyphen prompt, type *D 0040:006E*. The *D* command in Debug stands for *dump* and will give you an exuberant flood of numbers. The first two numbers you'll see in response to *D 0040:006E* should be the number of hours in the current time of day, stored (in hex) as low byte, high byte. Thus, if the time of day is 9:30 a.m., you should see 09 00. (To get out of Debug, type *q*.)

Now that we have the number of hours, Clock.com economizes further by not calculating the number of seconds; it calculates only to the most recent whole minute. The display it generates is therefore in the form 12:34, rather than 12:34:56. This means you won't have things blipping at you from the screen. In addition, the colon in the display doesn't blink (but you can make it do so, if you wish; there's some information at the end of this article about how to customize Clock.com to suit your taste).

Determining the time of day is easy enough, but how should we display it?



How To Get It on the Screen. Anyone with a smattering of assembly language knowledge might brightly suggest that we use one of the video I/O service routines—interrupt 10H or one of the functions of interrupt 21H. Sadly, we can't; the interrupts on the PC are not "re-enterable," which means that if some program produces output (a distinct possibility) and we decide to use that moment to put our clock on the screen by means of the same interrupt service routine that the program is deep inside, we will destroy many of the local variables that the interrupt happened to be using. After we're done with it, the interrupt service routine will be filled with our variables; and if it goes back to servicing the program, the interrupt will in all probability crash the machine.

We can avoid this problem by by-passing the video I/O interrupts and writing directly to the screen. IBM frowns on this practice, but we haven't been left much choice; if we're careful, things should work well.

The PC has a character buffer from which it reads whenever it puts characters on the screen. For each character, two bytes of information are stored—the character's attribute and the ASCII code for the character itself. The ASCII code determines what goes on the screen and the attribute determines how it will look (normal, blinking, inverse video, or invisible). (It is these attribute bytes that you can

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change in Clock.bas to customize your clock.)

There are actually two screen buffers in the PC's memory— one for the color/graphics adapter and another for the monochrome; the color/graphics buffer starts at B800:0000, and the monochrome buffer begins at B000:0000. This division of function allows you to have both cards in your machine at once and switch back and forth between them.

Our program has to determine which adapter you have so it can feed clock digits to the right place. We must keep in mind, too, that this part of memory is unique in that two parts of the PC—the screen and the CPU—have to be able to get at it. If we innocently sent in our clock digits whenever we felt like it, we would run the risk of hitting a time when the screen was trying to read this buffer; the result would be a screenful of cascading sparkles—attractive, perhaps, but not what we had in mind.

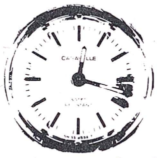
Since we want to interfere with the screen as little as possible (what the CPU does is much more under our control than what the screen does), we have to send our digits at just the right moment. This moment comes when the video controller has all the information it needs for the line it is currently scanning and about to send out. By watching for a low-to-high transition from the video controller status port, we can know when this moment comes; we can tuck our clock digit into the screen buffer right then. This interval is so ephemeral, though, that we have time for only one digit for each retrace. Therefore it takes ten line retraces for the whole clock display (five digit bytes and five attribute bytes). This is the way characters are actually written to screen by the video I/O interrupts themselves, so we have ended up by writing a mini-interrupt to suit our needs.

When Do We Put It on the Screen? One way of putting our clock on the screen is to have the PC run Clock.com as its main program, continuously sending its little flow of clock digits to the screen buffer. The clock is enjoyable to watch but not all that much fun after the first half hour—it would be preferable to let other programs run at the same time.

Given the fact that we'd like to have other programs running at the same time as our clock program, one approach might be to send clock digits only when the screen is erased (or the time changes). We can tell that a program is going to erase that part of the screen where our clock sits only when the program stays clean and works through the video interrupts. We can intercept these interrupts and decipher the program's directives before they take effect. Unfortunately, a preferred method among full-screen editors is to be just as direct as we have been and write immediately to screen, and we can't detect when they're about to do that (maybe this is why IBM frowns).

Therefore, the best way of updating our clock is to do it as often as we can. It may startle you to learn that with each tick of the timer—18.2 times a second—the PC stops whatever it's doing and calls interrupt 8 to update the timer count, check if the date has changed, and call yet another interrupt, 1CH. Interrupt 1CH is a dummy interrupt that simply points to an IRET (interrupt return) instruction. It is tailor-made for our requirements; since it gets called 18.2 times a second anyway, we can use it and turn indolence to profit by having it print out the time of day whenever it is called. What this means is that every time a program erases enough of the screen to remove the clock display, there is a flicker before the display blips back on—less than perfect but better than not reappearing at all.

The calculation of the time (that is, the minutes) is a burden we don't need 18.2 times a second—maybe just once every 500 counts. In the meantime, we can store the hours and minutes in a memory location that can be read quickly every time we want to redisplay.



How To Customize Your Clock. In case this program's unostentatious clock display doesn't sit well with you, here are some alternatives to try.

Among the first numbers in the data statements in Clock.bas are five 7s—7 7 7 7 7 (actually interspaced with 58s, which we'll leave alone). These 7s are the attribute bytes for the clock digits. The standard display—the one our program uses—is simply 7 7 7 7 7. You might want to try the executive model—8 8 8 8 8. This is a subdued gray (more properly, a dim green) and doesn't intrude much at all on whatever else you're doing. Not all screens support an attribute of 8; it could be that nothing at all will show up on your screen.

Next, for a blinking cursor, use 7 7 135 7 7. Or try the extra impact (112 112 112 112 112) or blinking impact (112 112 240 112 112) versions. For added emphasis, there's the emphatic model: 15 15 15 15 15. And for a real circus, you might try 240 240 240 240 240.

If you have a color monitor, you might want to try 1 1 1 1 1 (blue digits) or 2 2 2 2 2 (green digits). And if you're brave, try 196 196 196 196 196 (blinking bright yellow on a red background).

The assembly language source program is listed in figure 2. Assembly language programmers may notice the intrepid use of AAM (ASCII adjust for multiplication), an instruction that is long on utility but often left short in application.

continued on page 82

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continued from page 80

```
INTERRUPTS        SEGMENT AT OH
        ORG       1CH*4                 ;This is to use INT 1C
TIMER_INT         LABEL   DWORD         ;which is the timer interrupt
INTERRUPTS        ENDS

BIOS_STORAGE      SEGMENT AT 40H
        ORG       6CH                   ;The timer data is stored at
TIMER_LOW         DW        ?           ;40:6C and 40:6E
TIMER_HIGH        DW        ?
BIOS_STORAGE      ENDS

SCREEN  SEGMENT AT OBOOOH               ;A dummy segment to use as the
SCREEN  ENDS                            ;Extra Segment

CODE_SEG          SEGMENT
        ASSUME    CS:CODE_SEG
        ORG       100H                  ;ORG = 100H to make this into a
                                        ;".com" file
FIRST:  JMP       LOAD_CLOCK

        OLD_TIME_INT      DD        ?         ;The address INT 1C uses normally
        COUNT500          DW        O         ;Used to update clock every 500 counts
        CURSOR            DW        O         ;Location of the cursor on the screen
        VIDEO_PORT        DW        ?         ;Video status port - check for scanning
        DISPLAY           DW        5 DUP (073AH)   ; Initial value for the clock

CLOCK   PROC      NEAR    ;The timer interrupt will now come here.

        PUSH      AX                    ;Save the used registers for good form
        PUSH      CX
        PUSH      DI
        PUSH      SI
        PUSH      DS
        PUSH      ES

        PUSHF                           ;First, call old time interrupt
        CALL      OLD_TIME_INT

        ASSUME    DS:BIOS_STORAGE               ;Then, find the time
        MOV       CX,BIOS_STORAGE
        MOV       DS,CX

        MOV       CX,COUNT500                   ;Prepare to test if we should
        INC       CX                            ;recalculate the time - done every
        CMP       CX,500                        ;500 timer counts
        JB        DONT_RECALCULATE
        CALL      CALC                          ;Recalculate the time
        MOV       CX,O                          ;Reset Count500
DONT_RECALCULATE:
        MOV       COUNT500,CX                   ;Store incremented or zeroed value

        ASSUME    ES:SCREEN                     ;Set up screen as the Extra Segment
        MOV       CX,SCREEN
        MOV       ES,CX
        MOV       DX,VIDEO_PORT                 ;This is the screen status port
        MOV       DI,CURSOR                     ;Set up cursor on screen as destination
        LEA       SI,DISPLAY                    ;Set up the display in Memory as source
        MOV       CX,10                 ;To move 10 bytes (characters and attributes)

        CLI

SCAN_LOW:                               ;Start waiting for a new horizontal scan -
        IN        AL,DX                 ;Make sure the video controller scan status
        TEST      AL,1                  ;is low
        JNZ       SCAN_LOW

        MOV       AH,CS:[SI]            ;Move byte to be written to the screen into AH

SCAN_HIGH:                              ;After port has gone low, it must go high
        IN        AL,DX                 ;before it is safe to write directly to
        TEST      AL,1                  ;the screen buffer in memory
        JZ        SCAN_HIGH

        MOV       ES:[DI],AH            ;Do the move to the screen, one byte at a time
        INC       DI
        INC       SI

        LOOP      SCAN_LOW              ;Go back for next byte
        STI

        POP       ES                    ;Having done pushes, here are the pops
        POP       DS
        POP       SI
        POP       DI
        POP       CX
        POP       AX

        IRET                            ;An interrupt needs an IRET

CLOCK   ENDP

CALC    PROC      NEAR                  ;Here we recalculate the time and store it
        PUSH      AX                    ;Pushes to save everything that is destroyed
        PUSH      BX                    ;by CALC
        PUSH      CX
        PUSH      DX
        PUSH      DS

        ASSUME    DS:BIOS_STORAGE               ;Set up Data Segment to find time
        MOV       AX,BIOS_STORAGE
        MOV       DS,AX

        MOV       AX,TIMER_HIGH         ;Get the high byte of the timer, already
CHECK:  CMP       AX,12                 ;in hours; make sure it's less than 12
        JLE       VALID_TIME
        SUB       AX,12                 ;If not, keep subtracting 12 until it is
        JMP       CHECK
VALID_TIME:
        AAM                             ;Convert AX to BCD (a nice command)
        ADD       AX,3030H              ;Add '0' to both AH and AL to make into ASCII
        LEA       BX,DISPLAY            ;Set up BX as pointer to display in memory
        MOV       CS:[BX],AH            ;Move first hours digit into display
        MOV       CS:[BX+2],AL          ;Then second digit
        MOV       AX,TIMER_LOW          ;Get low byte of timer, in counts
        MOV       CX,8                  ;We want to multiply TIMER_LOW by 60 and
        SHR       AX,CL                 ;divide by 65536, so we MUL by 60 and shift
        MOV       DX,60                 ;right 16 times.
        MUL       DL
        SHR       AX,CL
        AAM                             ;Again, convert AX to Binary Coded Decimal
        ADD       AX,3030H              ;Add to make two ASCII characters
        MOV       CS:[BX+6],AH          ;And move them into the display in memory
        MOV       CS:[BX+8],AL

        POP       DS                    ;The requisite pops
        POP       DX
        POP       CX
        POP       BX
        POP       AX

        RET
        CALC      ENDP

LOAD_CLOCK        PROC    NEAR    ;This procedure intializes everything
        ASSUME    DS:INTERRUPTS   ;The data segment will be the interrupt area
        MOV       AX,INTERRUPTS
        MOV       DS,AX
        CLI

        MOV       AX,TIMER_INT                  ;Get the old interrupt service routine
        MOV       OLD_TIME_INT,AX               ;address and put it into our location
        MOV       AX,TIMER_INT[2]               ;OLD_TIME_INT so we can still call it.
        MOV       OLD_TIME_INT[2],AX

        MOV       TIMER_INT,OFFSET CLOCK  ;Now load the address of our clock
        MOV       TIMER_INT[2],CS               ;routine into TIMER_INT so the timer
                                                ;interrupt will call CLOCK
        STI

        MOV       AH,15                         ;Ask for service 15 of INT 10H
        INT       10H                           ;This tells us how display is set up
        SUB       AH,8                          ;Move to eight places before edge
        SHL       AH,1                          ;Mult by two (char & attribute bytes)
        MOV       BYTE PTR CURSOR,AH            ;Move cursor to its memory location
        MOV       VIDEO_PORT,03BAH              ;Assume this is a monochrome display
        TEST      AL,4                          ;Is it?
        JNZ       GET_TIME                      ;Yes - jump out
        ADD       CURSOR,8000H                  ;No - set up for graphics display
        MOV       VIDEO_PORT,03DAH

GET_TIME:
        CALL      CALC     ;This is to avoid displaying 00:00 for first 500 counts
        MOV       DX,OFFSET LOAD_CLOCK          ;Set up everything but LOAD_CLOCK to
        INT       27H                           ;stay and attach itself to DOS

LOAD_CLOCK        ENDP

        CODE_SEG          ENDS

        END       FIRST    ;END "FIRST" so 8088 will go to FIRST first.
```

Figure 1.

```
100       OPEN "CLOCK.COM" AS # 1  LEN = 1           'Open Clock.com
110       PRINT "CREATING CLOCK.COM"
120       FIELD #1,1 AS BYTE.$                       'Specify what goes into it
130       FOR N = 1 TO 267                           '267 bytes
140       READ BYTE.%
150       LSET BYTE.$ = CHR$(BYTE.%)                 'Load byte into buffer
160       PUT #1                                     'Write buffer out
170       NEXT N
180       CLOSE #1                                   'Close file
190       PRINT "CLOCK.COM CREATED."                 'And you're done.
200       END
210 DATA   233, 186, 0,   0,   0,   0,   0,   0
220 DATA   0,   0,   0,   0,   0,   58,  7,   58
230 DATA   7,   58,  7,   58,  7,   58,  7,   80
240 DATA   81,  87,  86,  30,  6,   156, 46,  255
250 DATA   30,  3,   1,   185, 64,  0,   142, 217
260 DATA   46,  139, 14,  7,   1,   65,  129, 249
270 DATA   244, 1,   114, 6,   232, 60,  0,   185
280 DATA   0,   0,   46,  137, 14,  7,   1,   185
290 DATA   0,   176, 142, 193, 46,  139, 22,  11
300 DATA   1,   46,  139, 62,  9,   1,   46,  141
310 DATA   54,  13,  1,   185, 10,  0,   250, 236
320 DATA   168, 1,   117, 251, 46,  138, 36,  236
330 DATA   168, 1,   116, 251, 38,  136, 37,  71
340 DATA   70,  226, 236, 251, 7,   31,  94,  95
350 DATA   89,  88,  207, 80,  83,  81,  82,  30
360 DATA   184, 64,  0,   142, 216, 161, 110, 0
370 DATA   61,  12,  0,   126, 5,   45,  12,  0
380 DATA   235, 246, 212, 10,  5,   48,  48,  46
390 DATA   141, 30,  13,  1,   46,  136, 39,  46
400 DATA   136, 71,  2,   161, 108, 0,   185, 8
410 DATA   0,   211, 232, 186, 60,  0,   246, 226
420 DATA   211, 232, 212, 10,  5,   48,  48,  46
430 DATA   136, 103, 6,   46,  136, 71,  8,   31
440 DATA   90,  89,  91,  88,  195, 184, 0,   0
450 DATA   142, 216, 250, 161, 112, 0,   46,  163
460 DATA   3,   1,   161, 114, 0,   46,  163, 5
470 DATA   1,   199, 6,   112, 0,   23,  1,   140
480 DATA   14,  114, 0,   251, 180, 15,  205, 16
490 DATA   128, 236, 8,   208, 228, 46,  136, 38
500 DATA   9,   1,   46,  199, 6,   11,  1,   186
510 DATA   3,   168, 4,   117, 14,  46,  129, 6
520 DATA   9,   1,   0,   128, 46,  199, 6,   11
530 DATA   1,   218, 3,   232, 109, 255, 186, 189
540 DATA   1,   205, 39
```

Figure 2.

▲

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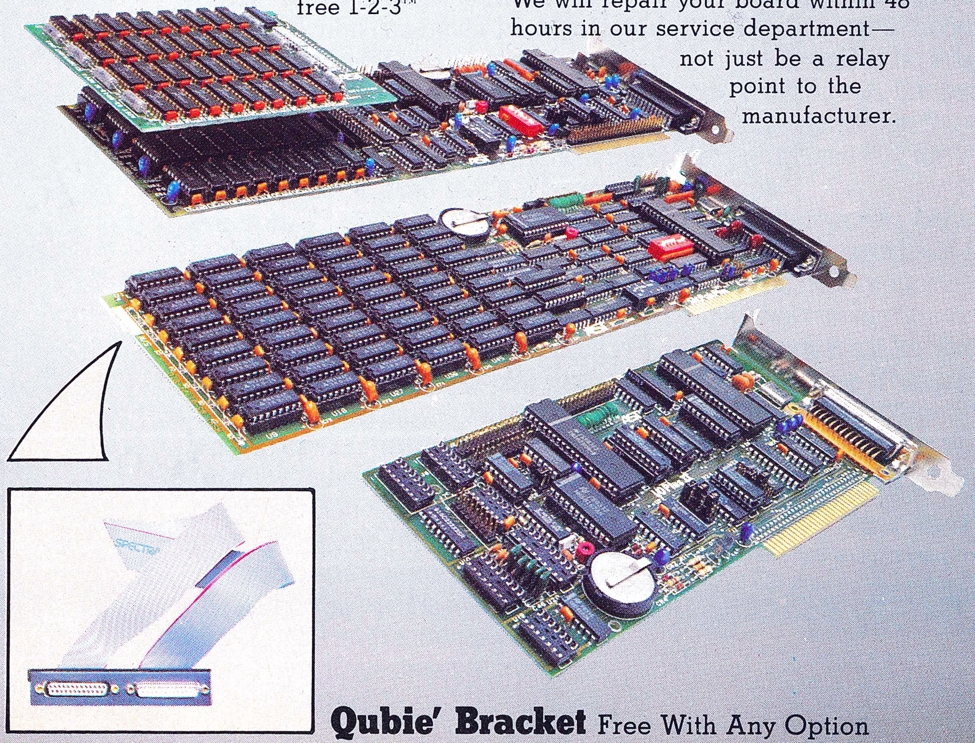

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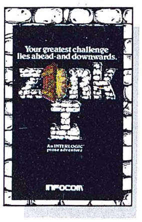
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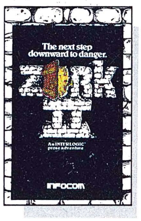
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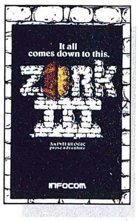
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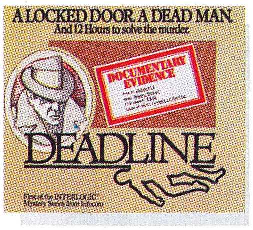
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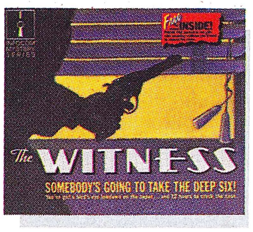
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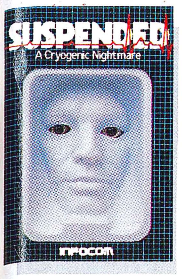
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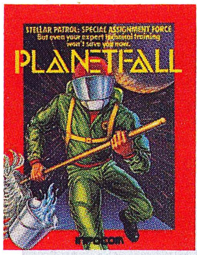
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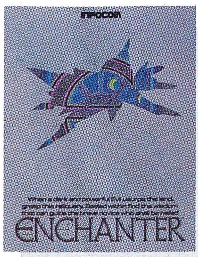
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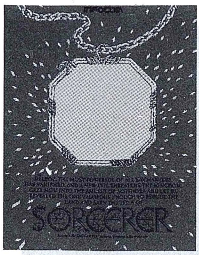
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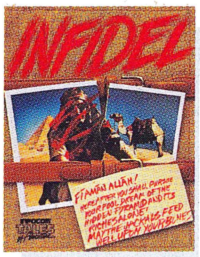
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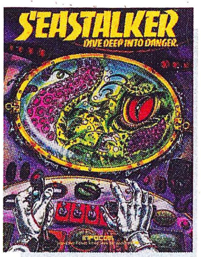
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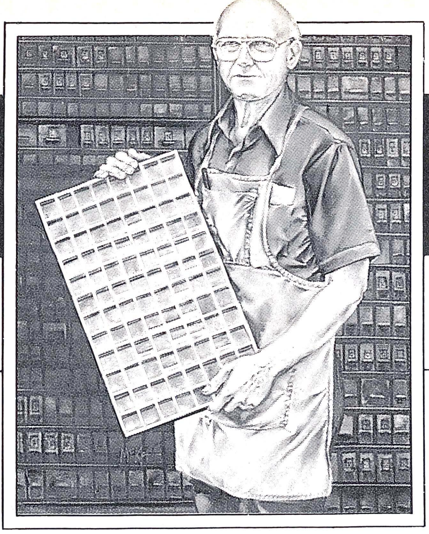

The Printed Word

by John Dickinson

The *EasyWriter II* Printer Driver

This month, as promised, we're going to look at the printer driver furnished with IUS's *EasyWriter II* word processing package.

Printer drivers, you may recall, are programs that provide the interface between software products and your printer. They are used for all printer commands, from simple character printing to simple and complex command sequences for print enhancement and formatting.

EasyWriter II's sophisticated printer driver is controlled by a table of printer command sequences that you fill in. The printer table covers a wide range of printing features and hooks up easily with the rest of the program's word processing functions.

The driver can be used for serial or parallel printers (IUS calls these Type A and Type B respectively), but its support for serial printers is less flexible. Serial printer owners who use DOS 2.0 or 2.1 can redirect the printer port from serial to parallel by means of the *mode* command.

This driver allows you considerable control over how *EasyWriter II* runs your printer. On a global level, for instance, you can choose to have the printer used either as an enhanced general printer or as an intelligent printer.

If you elect to run your printer as an enhanced general printer, the program will reprint lines or characters to simulate print enhancement features and issue extra line feeds for double or triple spacing and page feeding. An example of this kind of printer driver is the one used in *PFS:Write*, which we described last month.

If you prefer to have *EasyWriter II* treat your printer as an intelligent printer, the program will use whatever command sequences you provide to do print enhancement and formatting. But there's more to it than that. For any particular feature, you can choose between using your printer's intelligence or having your printer behave as an enhanced general printer. When you're using the printer's intelligence, the choice of command sequences for each print enhancement and formatting feature is yours.

If you've chosen to have *EasyWriter II* use your printer's intelligence, you first load the printer driver table with command sequences for your own printer. This table may look awesome the first time you see it; the table takes up five separate screens. Documentation for the table in the (otherwise excellent) user manual is adequate but not wonderful. But, if you've been following this column and have made a reference card for your printer, loading *EasyWriter II*'s printer table won't be hard to do.

IUS has made things a bit easier by delivering the program with the printer driver's table loaded for the older-model IBM matrix printer, which is almost exactly like the Epson MX-80 (without Graftrax) that we've been using as our example printer. In addition, IUS has supplied retailers with a disk containing suggested printer table configurations for more than thirty popular printers, and yours is likely to be among them.

Notice we said *suggested* table configurations. The biggest advantage of user-supplied printer driver tables is that you can make them do whatever you want. If you don't agree with IUS's suggestions for your printer, you can install whichever command sequences you prefer.

Once the table is loaded with your command sequences, *EasyWriter II* takes over and does all the work. You only have to remember some simple alt-key combinations for specifying print enhancements and how to use the program's line rulers to specify character font size (pitch) and line height.

Screen display enhancements of your text, along with line ruler and status information, show you what printer features you're using. The status and ruler information comes in handy because *EasyWriter II* lets

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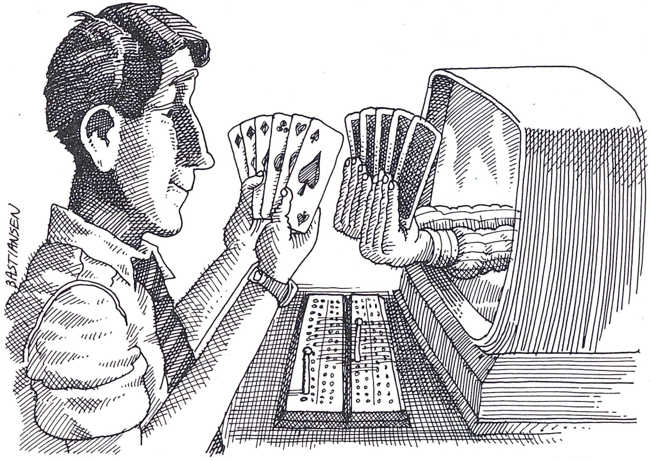

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you use any number of printer features at once, and display enhancements alone can't show you which features you're using for a given piece of text. The program has help menus in case you forget how to use a printer feature.

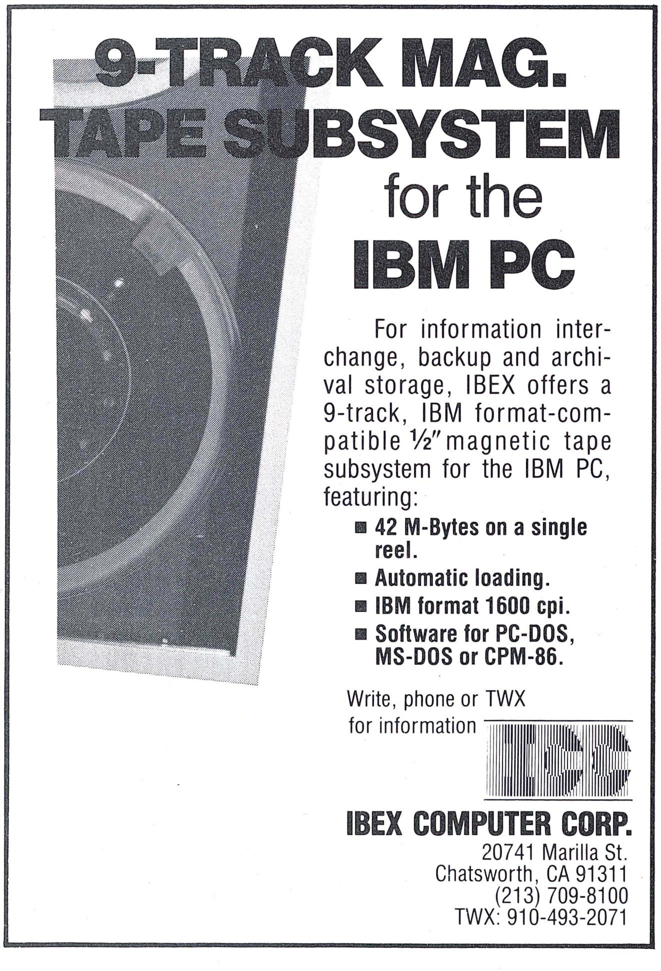
IUS provided us with a copy of the disk of suggested printer table configurations that they supply to retailers. We'll use their suggested MX-80 driver table as a starting point for the discussion that follows. If you've been reading this column, you'll probably recognize many of the command sequences the table contains.

We'll also change some of the values in the IUS-supplied MX-80 table to demonstrate the table's flexibility. You may not want to use every command sequence the IUS staff chose for its MX-80 table, but *EasyWriter II* couldn't care less; the program will use any command sequence you tell it to, wherever you say to use it.

EasyWriter II's printer driver table is divided into three parts. The first part, which consists of one screen, contains globally used command sequences, such as the code for backspace and carriage-return commands. Included here is a field for resetting the printer, which is handy if your printer (like the MX-80) doesn't include its own command sequence for this purpose. With this field you can disable any previously enabled features before starting to print. This printer-reset command sequence in the table is invoked every time you tell *EasyWriter II* to start printing.

The second part of the printer driver table, contained on two screens, lists command sequences that affect line ruler parameters. These are the commands for line height (vertical spacing) and character font (horizontal spacing). *EasyWriter II*'s rulers are used for margin and tab settings, so this is a natural place to select character fonts.

The third part of the table, also on two screens, contains command sequences that affect print enhancements. Included are such items as boldfacing, underlining, subscripts and superscripts. If your printer can use different-colored ribbons, the command sequences controlling ribbon change go here as well. You can also specify how *EasyWriter II* should do double underlining if your printer can do the reverse line feeding usually necessary for this feature.



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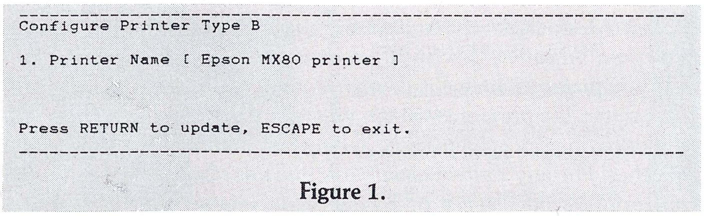
When filling out this part of the table, you supply an enable command sequence and a disable command sequence for each print enhancement feature. Alternatively, you can specify for any given feature that the printer use backspace or carriage return commands in enhanced general printer mode. The choice between backspace or carriage return will depend on whether your printer can do a carriage return without a line feed. If your printer can't do this, you can use the backspace option, but printing speed will be reduced.

In almost all cases, you're allowed to enter up to twelve ASCII character sequences for each of the commands in the table. That should be plenty for your printer, although it may be a close call for the reset sequence. Any characters entered for the command sequences must be expressed in decimal ASCII notation (see the February installment of this column).

When you examine the table, you might think it's too sophisticated for your printer because your printer doesn't have many of the features *EasyWriter II* supports. But this isn't a problem; all you have to do is leave the command sequences for those features blank. *EasyWriter II* ignores blank fields in its printer table, even if you try to use the unspecified features in your text.

The MX-80, for instance, lacks many of the features *EasyWriter II* supports; thus much of the table supplied by IUS for this printer is blank. You'll see in a moment that you can fill it up by working the MX-80's computer (or your own printer's computer) a little harder than IUS suggests and thereby get a little more printing flexibility and speed.

We'll begin by briefly describing each screen in the printer table IUS supplies for the MX-80 (we'll look at the parallel interface version of the table), starting with one screen we haven't mentioned yet. This first screen allows you to give your printer a name—and you can use anything you want, up to thirty characters. Figure 1 shows this portion of the table as supplied by IUS for the MX-80 (the underscored characters are data you can enter). There's nothing fancy here, but the figure does demonstrate how to enter data and update the table.


```
---------------------------------------------------------------------
Configure Printer Type B

1. Printer Name [ Epson MX80 printer ]


Press RETURN to update, ESCAPE to exit.
---------------------------------------------------------------------
```

Figure 1.

Entering command-sequence data is simple. The cursor always starts at the beginning of the first field, and all you have to do is type in whatever data you want. On the table's other screens, which use more data fields than this first screen, you just press the tab key to move from field to field.

To change the name of the printer, just enter whatever you want, like this:

1. Printer Name [MX-80 Printer W/O Graftrax]

Pressing enter updates the field. If you want to quit, press the escape key and you'll be returned to *EasyWriter II*'s system menu. Be aware, however, that any screens that you've already updated will be remembered by *EasyWriter II*; if you've made a mistake on a previous screen, you'll have to reenter the data because the program only goes through the screens in forward sequence.

Things get more interesting in the second screen. This is where you enter what IUS calls global command sequences for such things as the carriage return, the line feed, and so on. This screen also includes the printer reset command sequence, by means of which you disable any

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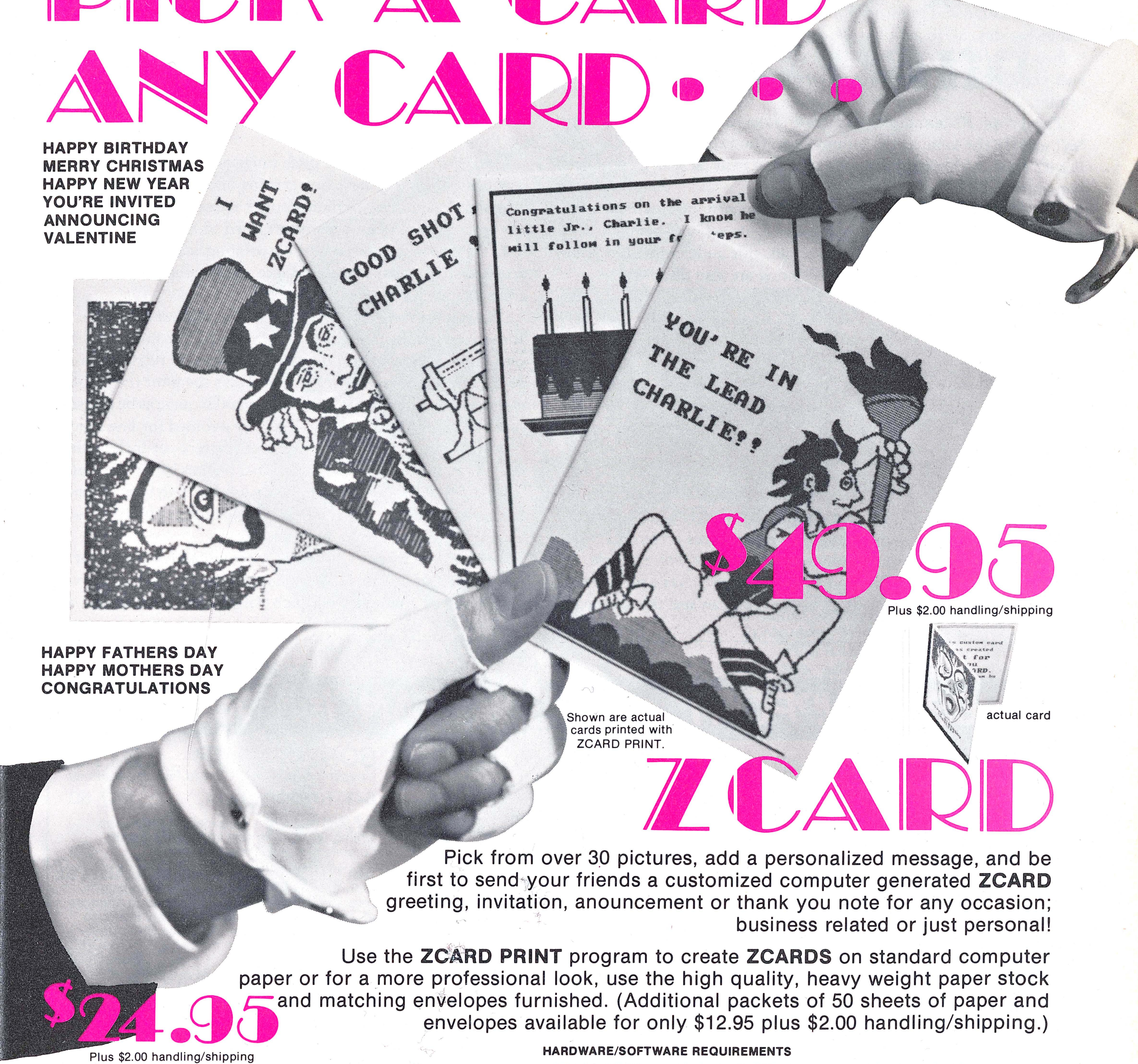
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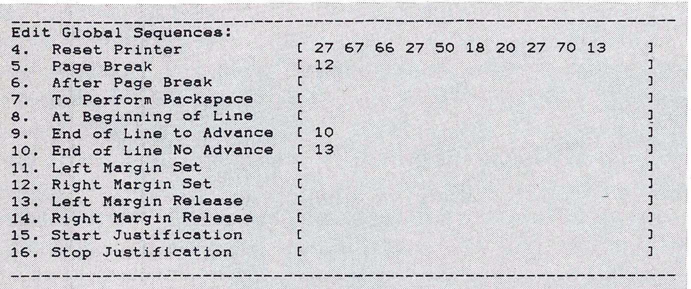
previously enabled printer features. You'll find the reset feature to be an important command sequence for *EasyWriter II*; you may also find it somewhat difficult to get right the first time, unless your printer has a built-in reset feature. You may have to change the reset sequence whenever you change the way other command sequences are used for your printer.

EasyWriter II's terminology in this and the rest of the table's screens isn't exactly the same as the terminology you've seen in this column, but it's close, and you'll have little difficulty figuring which command sequences are which.

IUS defines the printer reset command sequence—item 4 in screen 2; it's not clear why there are no fields 2 and 3—to set lines per page at 66 and lines per inch at 6 and to disable both wide and compressed printing. Emphasized and double-strike printing are also disabled.



```
-----------------------------------------------------------------
Edit Global Sequences:
4.  Reset Printer            [ 27 67 66 27 50 18 20 27 70 13   ]
5.  Page Break               [ 12                              ]
6.  After Page Break         [                                 ]
7.  To Perform Backspace     [                                 ]
8.  At Beginning of Line     [                                 ]
9.  End of Line to Advance   [ 10                              ]
10. End of Line No Advance   [ 13                              ]
11. Left Margin Set          [                                 ]
12. Right Margin Set         [                                 ]
13. Left Margin Release      [                                 ]
14. Right Margin Release     [                                 ]
15. Start Justification      [                                 ]
16. Stop Justification       [                                 ]
-----------------------------------------------------------------
```

Figure 2.

Many of the other items in the global sequences screen may look familiar to you, but others may not be so obvious. For example, the field for the page-break command sequence (item 5) has a form feed in it. If your printer has a cut-sheet feeder, you can use this command sequence to insert a new page of paper as well. Many printers with this feature require that you restart or otherwise reset the printer after each new sheet; *EasyWriter II*'s printer table allows for this (after page break, item 6). Additional uncommon features supported by *EasyWriter II* are margin set and release (items 11 through 14) and line justification (items 15 and 16). Also, some items in screen 2—backspace, for example—are blank simply because they're not required in a table for the MX-80.

EasyWriter II's character pitch range and vertical line-spacing specifications occupy the next two screens and are used primarily by the program's line rulers. Default settings are supplied for both pitch and line spacing, and these become attached to the printer reset sequence from the previous screen whenever printing activity is started. The vertical line-spacing parameters are also used by the program's pagination and adjustment functions.

You can use these two screens to tell *EasyWriter II* whether pitch and line-spacing command sequences need to be transmitted to the printer each time a new line is printed. Your printer will run faster if you don't do this, but some printers require it. IUS's specs for the MX-80 require that both pitch and line-spacing command sequences be transmitted for each line, but this can (as you'll see) be avoided for line spacing.

Pitch ranges are specified using characters-per-inch settings. Why ranges were used instead of individual pitches isn't clear, but those allowed by the program are commonly used in both typewriter and typesetting applications. Legal values are documented in the user manual and are too numerous to mention here.

You can specify any character font command sequence for any pitch range, but it's advisable to keep *EasyWriter II*'s pitch range values and your printer's characters-per-inch values somewhat in line with each

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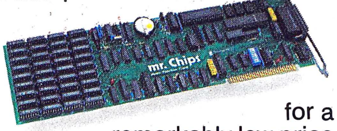

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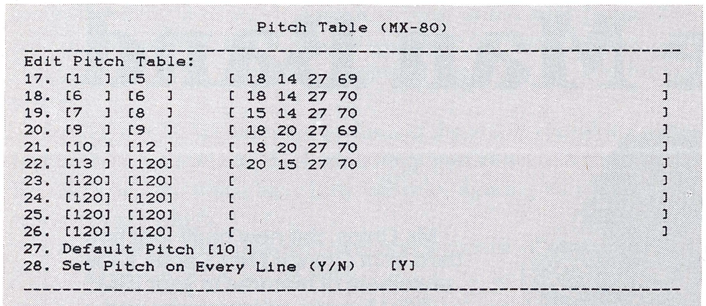
other unless you have a photographic memory for detail. Figure 3 shows the pitch range table IUS suggests for the MX-80.



```
                         Pitch Table (MX-80)
---------------------------------------------------------------
Edit Pitch Table:
17. [1   ] [5   ]     [ 18 14 27 69                          ]
18. [6   ] [6   ]     [ 18 14 27 70                          ]
19. [7   ] [8   ]     [ 15 14 27 70                          ]
20. [9   ] [9   ]     [ 18 20 27 69                          ]
21. [10  ] [12  ]     [ 18 20 27 70                          ]
22. [13  ] [120]      [ 20 15 27 70                          ]
23. [120] [120]       [                                      ]
24. [120] [120]       [                                      ]
25. [120] [120]       [                                      ]
26. [120] [120]       [                                      ]
27. Default Pitch [10 ]
28. Set Pitch on Every Line (Y/N)    [Y]
---------------------------------------------------------------
```

Figure 3.

There are two important items to note in specifying pitch ranges. Command sequences are included for each pitch to disable previously selected character fonts—it's important to disable subsequent fonts for the MX-80 and most matrix printers. If you enable wide characters without disabling compressed characters, for instance, you will wind up with compressed-wide characters at 8.5 characters per inch. You wanted five characters per inch, so you want to be sure *EasyWriter II* disables compressed characters (and any other fonts that may be in effect). In the table supplied by IUS, the 8.5 characters-per-inch command sequence is specified for two pitch ranges: seven to eight characters per inch and nine to nine characters per inch (lines 19 and 20 in figure 3).

Another technique used in the table is to include print enhancements within the pitch specifications. For example, the command sequence specified for pitch range nine through nine (line 20 of figure 3) includes emphasized printing; the same is true of the one-through-five range. This technique, which allows you to select emphasized printing by calling on the appropriate pitch range via a line ruler (instead of by using an alt-key combination), can be a real convenience for emphasizing large blocks of text.

You could easily change the pitch table to use double-strike as well as emphasized printing for pitch ranges one through five and nine through nine. You'd just enter the following data into the screen (in the appropriate fields):

17. [1] [5] [18 14 27 69 27 71]
19. [9] [9] [15 14 27 69 27 71]

To finish the job, you'd have to change the other pitch-range command sequences to make them disable double-strike.

The line-spacing screen is similar to the pitch-ranges screen and shouldn't need much explanation. One thing you might notice, however, is that the suggested command sequences for line spacing use extra line feed (ASCII 010) command sequences to do most of the work, much as printer drivers using the enhanced general printer technique do.

You can speed up the MX-80's line feeding by using variable line spacing command sequences to specify spacing in seventy-seconds of an inch. Each line feed command sequence requires a separate, time-consuming action on the printer's part. In addition, because the IUS specification uses extra line feeds to do most of the work, the command sequences have to be loaded every line, which slows things down even further. Correct variable line spacing requires only one line feed per line and doesn't require reloading the command sequence for every line. Even though these are complex command sequences, there's plenty of room in *EasyWriter II*'s table to specify what we need.

Telling *EasyWriter II* about variable line-spacing command sequences is easy. Here's how you would do it for one, two, and three lines per inch:

29. [1] [1] [27 65 72]
30. [2] [2] [27 65 36]
31. [3] [3] [27 65 24]

When you use these command sequences, *EasyWriter II* no longer has to issue new ones every line, so you can tell it:

40. Set Spacing on Every Line (Y/N) [N]

EasyWriter II can absorb these and even larger commands without difficulty. The program will do just about anything you tell it to when it comes to using your printer's intelligence.

EasyWriter II's print enhancement features are entered in two related font-support tables. The first one, shown in figure 5, specifies whether you want the program to do print enhancement using enhanced general printer techniques or using printer intelligence. If you choose the former, you can use either backspace or line reprinting. Figure 5 shows IUS's suggestions for the MX-80.

Once you've filled out this part of the table, you can specify the command sequences for those enhancements for which you want *EasyWriter II* to use printer intelligence; you do this in the screen shown in figure 6. IUS suggests using enhanced general printer (line reprint) techniques for the MX-80, and the table they provide for the printer is set up to do that; figure 5 has all options set to 1, and screen 6 has only blank entries. We'll change screen 5 to have *EasyWriter II* use intelligent printer command sequences for bold and shadow printing, and in the

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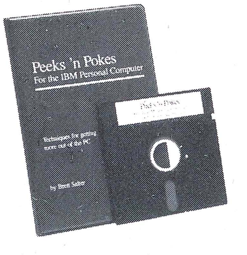
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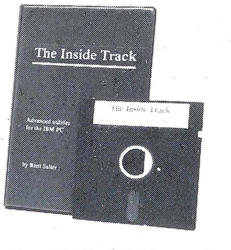

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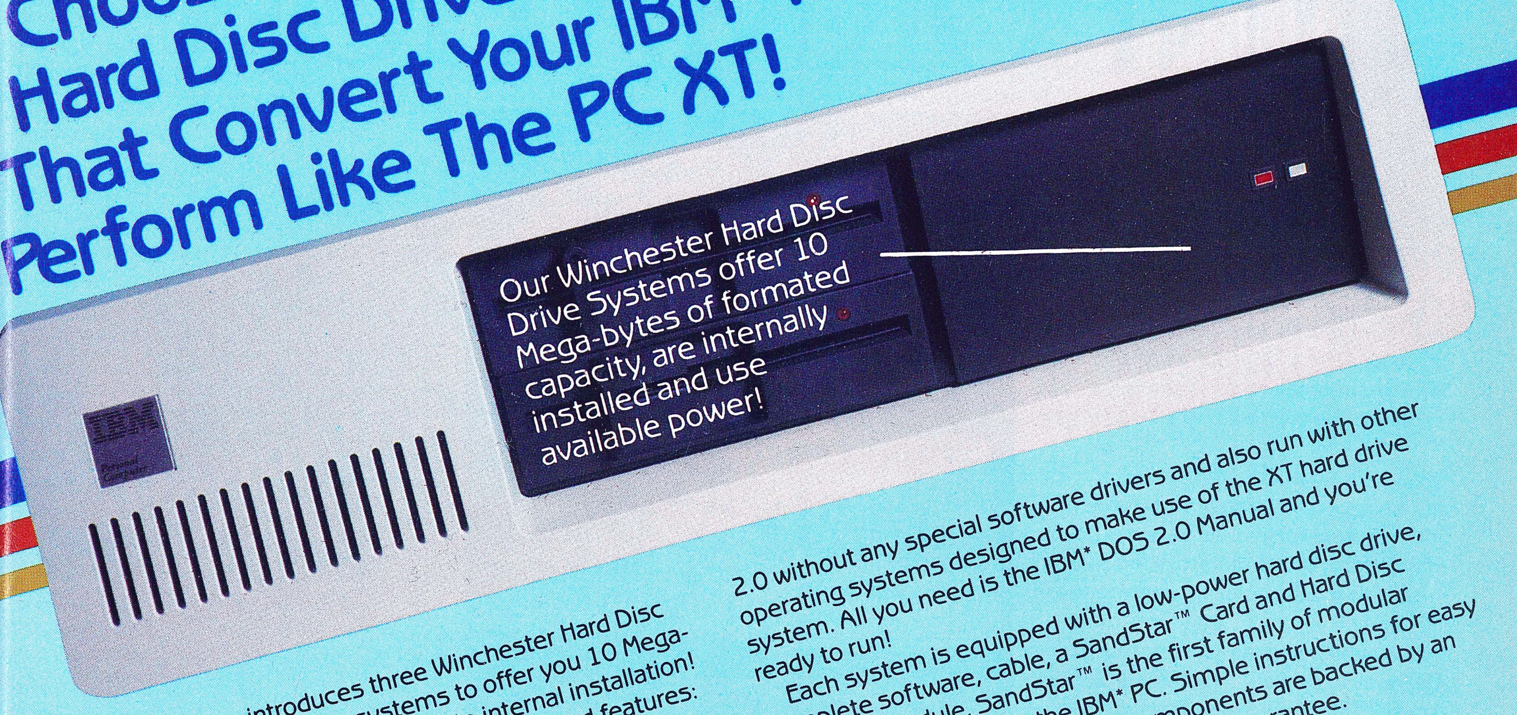

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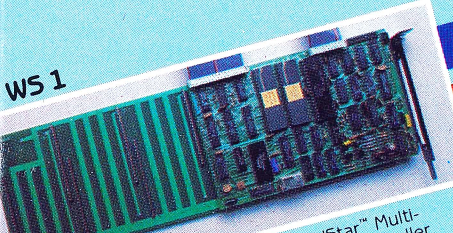

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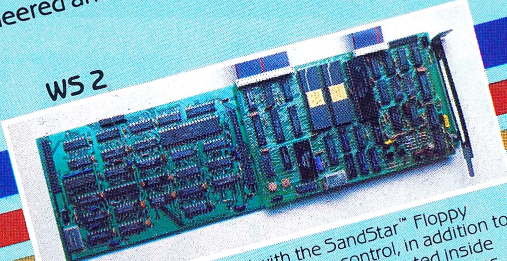

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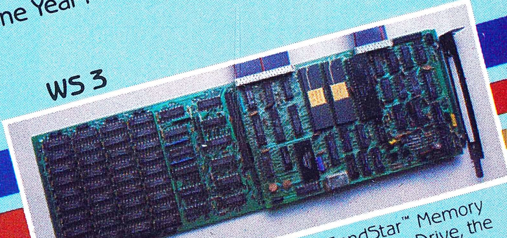

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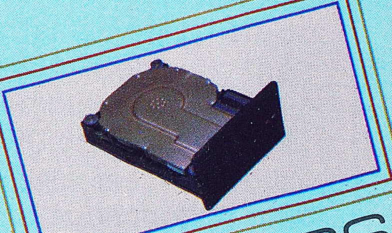

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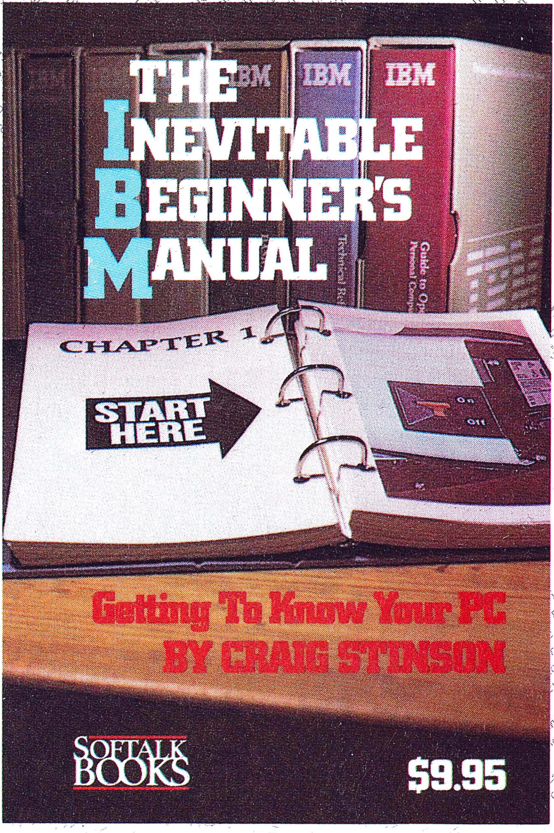
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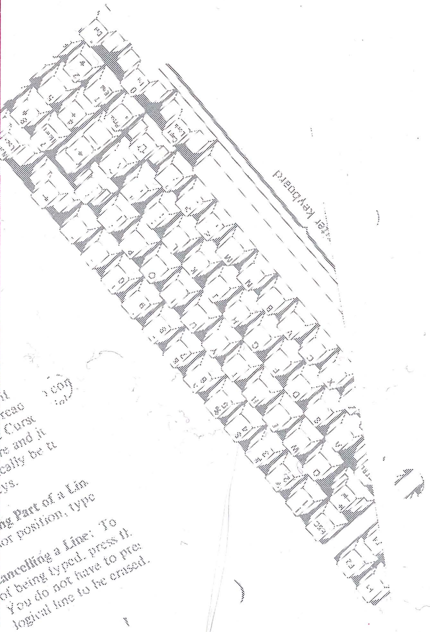

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process we'll see how screen 6 can be filled out to specify emphasized printing command sequences for the MX-80.

First, set up *EasyWriter II*'s bold and shadow printing to use intelligent printer command sequences:

41. Bold/Shadow Face Support [2]

Then, by filling out the appropriate entries shown in figure 6, enable the MX-80's emphasized printing for boldface and its double-strike printing for shadow.

```
--------------------------------------------------------------------------
Edit Line Spacing Table:
29. [1  ] [1  ]      [ 10 10 10 10 10                                   ]
30. [2  ] [2  ]      [ 10 10                                            ]
31. [3  ] [3  ]      [ 10                                               ]
32. [4  ] [4  ]      [ 27 48 10                                         ]
33. [6  ] [6  ]      [ 27 50                                            ]
34. [8  ] [8  ]      [ 27 48                                            ]
35. [48 ] [48 ]      [                                                  ]
36. [48 ] [48 ]      [                                                  ]
37. [48 ] [48 ]      [                                                  ]
38. [48 ] [48 ]      [                                                  ]
39. Default Line Spacing [6 ]
40. Set Spacing on Every Line (Y/N)     [Y]
--------------------------------------------------------------------------
```

Figure 4.

```
--------------------------------------------------------------------------
Edit Font Support:                   1. Two Pass Support
                                     2. Control Code Support
                                     3. Backspace Support
41. Bold/Shadow Face Support  [1]
42. Single Underline Support  [1]        Using Character [95 ]
43. Double Underline Support  [1]        Using Character [95 ]
44. Overstrike Support        [1]
45. Special (Color) Support   [1]
46. Sub/Superscript Support   [1]
47. Will underline retain font (Y) or be normal font (N)?   [N]
48. Will double underline be an extra pass (Y/N)?           [Y]
49. Start double underline    [                                   ]
50. After double underline    [                                   ]
--------------------------------------------------------------------------
```

Figure 5.

```
--------------------------------------------------------------------------
Edit Font Sequences:
51.  Normal to Bold         [ 27 69                                     ]
52.  Bold to Normal         [ 27 70                                     ]
53.  Normal to Shadow       [ 27 71                                     ]
54.  Shadow to Normal       [ 27 72                                     ]
55.  Normal to Underline    [                                           ]
56.  Underline to Normal    [                                           ]
57.  Normal to Double       [                                           ]
58.  Double to Normal       [                                           ]
59.  Normal to Overstrike   [                                           ]
60.  Overstrike to Normal   [                                           ]
61.  Normal to Special      [                                           ]
62.  Special to Normal      [                                           ]
63.  Normal to Subscript    [                                           ]
64.  Subscript to Normal    [                                           ]
65.  Normal to Superscript  [                                           ]
66.  Superscript to Normal  [                                           ]
--------------------------------------------------------------------------
```

Figure 6.

Each print enhancement has an enabling and disabling command sequence for you to specify in this screen, and you should be sure to enter both. If you don't, *EasyWriter II* may have no way to stop any printer feature you enable. You should also remember to update the printer reset command sequences in figure 2 to reflect any other changes you make.

A built-in print spooler is also available in the 96K version of *EasyWriter II*. The spooler runs in the background and lets you print any number of documents by stacking them in a first-in first-out queue. You can continue editing any document not currently being printed. The spooler lets you specify whether printing should stop after each page of a document.

EasyWriter II's printer driver can get better-than-usual-quality printing out of a printer as simple as the MX-80. Owners of more advanced printers can easily see how much they can do with their machines using a table as flexible as *EasyWriter II*'s. It's not perfect, but it's very good. ▲

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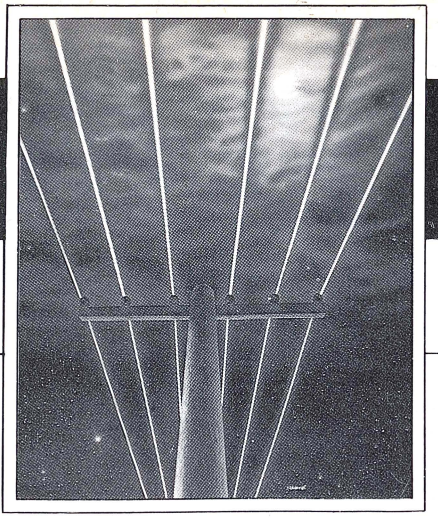

COMM LINES

by Charles Daney and Tom Foth

Why Asynch Isn't Always Enough

By now, readers of this column should have a good understanding of asynchronous communications. Previous installments of "Comm Lines" have treated most of the issues concerning this form of telecommunications: the RS-232 interface; the characteristics of modem digital-to-analog and analog-to-digital conversion; how bits are transmitted and received; and the composition of an ASCII byte (including parity).

A solid understanding of asynchronous communications is important to those interested in telecommunications in general; of all of the telecommunications protocols, it is probably the easiest to understand, and its principles are generally applicable to other forms of telecommunications. As the least expensive form of telecommunications to implement, asynchronous communication has become a de facto standard and comprises the bulk of telecommunications traffic today. It's also a good example of how heritage plays such an important role in the way some mainframes implement telecommunications.

In the early days of computers, a device called a Teletype was commonly used for transmitting messages across the country. Teletypes converted text, as typed by an operator, into electrical pulses and were the first widely used human-computer interface.

Teletypes were marvelous machines with intricate mechanisms that converted a keystroke into a timed series of switch openings and closings. The switch allowed current, sent to the receiving machine, alternately to flow and not flow. This current would energize a solenoid—an electromechanical device that would pull a plunger in when current flowed through it and release the plunger when no current was flowing. The solenoid's plunger, in turn, was connected to a mechanical system that would store a series of pulses by shifting various metal bars as the current was turned on and off. When all the pulses had been received, the bars would be oriented in such a manner as to allow a particular print element to strike the page.

The receiving mechanism used an electrical motor drive to move the bars as the solenoid was energized and then to strike the page with the selected print element; therefore it was desirable to keep the motor turned off until a character was being transmitted. So, before the series of bits that represented the character were transmitted (by turning the switch on and off), the switch (which normally was on, allowing current to flow) was momentarily turned off by the sending machine. This notified the receiving machine that transmission was about to occur and thus that the motor should be started; it also allowed the receiving system to synchronize its motor's speed with the speed of the sending system. Similarly, when all the bits had been sent, the sending machine left the switch closed for some period of time before sending the next character. If no character followed, the switch simply remained closed; this let the receiving system know that it could turn off its motor. An electromechanical timer then allowed the motor to run for a few more seconds in case more characters were forthcoming, thus preventing the motor from starting and stopping frequently.

You might recognize the beginning switch opening as a *start* bit and the final switch closure as a *stop* bit—and the whole process as asynchronous communication.

Teletypes, because of their mechanical nature, could not store more than one character at a time. For this reason, early computers (and operating systems) treated the Teletype as a character device; each input or output instruction dealt with one character. Also, the fact that the Teletype was a character device meant that the operator could press a single key to invoke some sort of control operation in the operating system, such as to halt a program.

Because of its mechanical nature, the Teletype could provide only the most rudimentary error-checking. With no ability to store information or perform any sort of computation, the best error-checking the Teletype could offer was parity-checking on a byte-by-byte basis. Since parity generation doesn't require calculation (a given character's parity is always the same), its inclusion simply requires sending an additional precomputed bit. Detecting parity errors is simple, too: If the received value doesn't match a known valid code, a parity error has occurred.

Unfortunately, parity-checking will not catch errors that affect an even number of bits. Why? Let's review parity.

To transmit the ASCII value for the letter "C" (decimal 67), we would send the binary value 1000011. Now, in an even-parity environment, we would also send a parity bit whose value is 1, so that the total of all of the 1 bits would be even (in this case, there would be four 1 bits). If the number of 1 bits was already even (as is the case, for example, in the letter "A," binary 1000001), we would maintain that even number of 1 bits by sending a parity bit of 0. We would do the opposite in both cases to achieve odd parity.

Now let's say that an error in transmission occurs, and, instead of receiving the letter "C," the receiving system reads binary 1001111 (decimal 79, the letter "O"). Well, with our 1 bit sent along for even parity, the number of 1 bits is still even; so no error is detected.

The following table provides examples of missed errors of two bits in an even-parity environment:

Editor's Note: This is a continuation of the original "Comm Lines" column, by Kevin Goldstein, which ran from June 1983 to March 1984. The new "Comm Lines" will focus on communications between PCs and the mainframe world.

Charles Daney has twelve years' of experience in graphics, operating systems, computer conferencing, and asynchronous communications. Tom Foth is a senior member of the technical staff of the Adesse Corporation, a Ridgefield, Connecticut, based company that specializes in the development and delivery of VM/CMS-related programs and services. Daney and Foth are currently working on a new interpretive language for the PC and a computer conferencing system.

Intended value: 000
Even parity: 0

Value received	Number of 1 bits including parity	Error detected?
001	1	yes
010	1	yes
011	2	no
100	1	yes
101	2	no
110	2	no
111	3	yes

The probability that two or more bits will be transmitted in error gets us into some complex noisy-coding theories. It's sufficient to say that as the transmission rate increases and the duration of a bit thereby decreases, the opportunity becomes larger for noise pulses to be of sufficient length to affect multiple bits.

This simple illustration should be adequate to demonstrate that one-bit parity-checking does not provide sufficient error detection for most data communications that require relatively error-free reception. It should also be said that noise does not occur only in environments where computers are connected via modems and telephone lines; research indicates that, while it occurs less frequently, noise also exists on lines that directly connect computers only a few feet apart.

Even if it had been possible for Teletypes to provide more sophisticated error-checking, it would have been inappropriate. To transmit a seven-bit ASCII byte with parity-checking takes ten bits: one start bit, seven data bits, one parity bit, and one stop bit. This represents an overhead of 30 percent per character.

Because of these limitations, mainframes have typically used asynchronous ASCII strictly for terminal communications; the data passed between a human at a terminal and a computer is rather minimal, and thus the overhead is not prohibitive. Furthermore, most applications validate the input they request of their human operators (if they don't, they should) and thus should detect many if not most errors missed by parity-checking. Finally, when data is received by a human operator, error-checking is somewhat less crucial, because most human operators can detect bad information and take appropriate actions.

Because asynchronous ASCII communication does have many positive attributes, many people are trying to use it to communicate data (other than terminal emulation) from a PC to a mainframe. This is unfortunate; as we have seen, asynchronous communication in this context is inappropriate for at least two reasons. First, most implementations that rely strictly on parity-checking (that's probably 99 percent of all implementations) do not provide adequate error-checking. Second, there's a 30 percent overhead involved in sending seven bits with parity.

Another major difficulty of using asynchronous ASCII for file transmission is that many (if not most) mainframe operating systems attach certain meanings to certain ASCII values. This is especially a problem when you want to send a file (such as a .com or .exe file) that contains binary values. Also, to transmit binary files it is necessary to send whole bytes completely unaltered. Sending a whole byte (eight bits) is a major problem: by definition ASCII characters are only seven bits in length.

Many software vendors have come up with schemes to get around these problems. IBM, realizing the limitations of its own mainframe asynchronous ASCII support, provides a rudimentary file-transfer mechanism with both the *Asynchronous Communications Support* and *3101 Emulation Program*; this mechanism is a program called Fileconv.

Fileconv converts a file from binary form to a form that consists of only printable ASCII characters. It does this by taking three bytes (twenty-four bits) and dividing them into four groups of six bits. Each of these four groups of six bits is then used as an index into an array of sixty-four printable characters (six bits can represent the decimal numbers 0 through 63). These printable characters are digits, uppercase letters, lowercase letters, the period, and the comma. Thus each group of six bits is converted to one printable character. This also means that every three bytes of input data results in four output characters.

In addition, certain characters are used as control characters: The left square bracket represents the beginning of "converted" bytes and the right square bracket indicates the end of "converted" bytes. The use of these control codes enables Fileconv to transmit printable characters (characters that are among the sixty-four listed above) without converting them. The point here is efficiency; it's more efficient to translate one data byte to one output byte than to translate three bytes to four output bytes.

The tilde character is used to indicate repeated characters for the sake of compression. Following the tilde is the number of characters in the run (expressed as a number from 0 to 63 and encoded as one of the printable characters) and a two-digit hexadecimal representation of the character. Thus nine spaces would be compressed to the string "~920".

The "at" sign is used to delimit the end of each data record. Following the at sign is a record-sequence character (again, one of the printable characters). This value wraps (that is, starts over) every sixty-four lines. This character is used when Fileconv converts the file back to binary to make certain that records are received in order.

Following the record-sequence character are four bytes representing the hexadecimal value of a sixteen-bit cyclic redundancy check

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(CRC) followed by a carriage return. The length of a record (or line, if you will)—including all control characters, the sequence character, and the CRC characters—never exceeds eighty characters; this limit ensures compatibility with most mainframes.

A CRC is an elaborate error-checking scheme that involves performing a fairly extensive calculation based on all the bits in all the characters of a given record. Used by IBM for their most sophisticated data communications implementations, the CRC method can detect 99.9969 percent of all errors in a record.

Finally, a pound sign ("#") at the beginning of a line indicates the end of the file.

A note to potential Fileconv users who also use IBM's VM/SP mainframe operating system: You will need to execute the command

```
TERMINAL CHARDEL OFF LINEDEL
OFF LINEEND OFF
```

This is because VM/SP defaults to using the at sign as the signal to delete the previous character, the left square bracket to indicate "delete to the beginning of the line", and the pound sign to indicate the end of a logical line.

Unfortunately, there is no Fileconv-like conversion utility for IBM mainframe operating systems. Thus, while it is possible to send a converted binary file to a mainframe, there is no utility allowing you to convert that file back to binary for use by mainframe applications. Neither can mainframe applications send binary files to the PC for conversion by Fileconv. The best you can do is upload a file converted by Fileconv to the mainframe and then download it to another PC, where Fileconv can be run to restore it to its original binary state.

Some other asynchronous ASCII communications programs for the PC do provide mainframe counterparts that allow mainframe-based applications to read uploaded binary files as well as to transmit binary files to PCs. We'll look at some of these in future installments of this column.

Fileconv does illustrate, however, some typical inefficiencies of using asynchronous ASCII communications to communicate with a mainframe host. Quite apart from the 30 percent overhead involved in asynchronous ASCII, schemes such as the "three data bytes in for four transmittable bytes out" impose an additional overhead of up to 33 percent.

For all the reasons outlined here, PC users who need to communicate high volumes of data quickly and accurately should consider binary synchronous (bisync) interfaces. We'll also be checking into these in future installments.

If you have a question concerning data communications or a suggestion for a topic for this column, send a note c/o "Comm Lines," Softalk/IBM, Box 7040, North Hollywood, CA 91605. ▲

BASIC
IBM Personal Computers
Hardware Reference
Cartridge BASIC

JR BASIC VS. PC BASIC: WHAT'S THE DIFFERENCE?

BY DIAN CRAYNE

As if it weren't enough to have confused everyone with ROM Basic, Disk Basic, and Advanced Disk Basic (BasicA), IBM has made the computing waters even murkier by introducing Cartridge Basic for the PC*jr*.

In some ways the differences between Disk Basic and Cartridge Basic don't really matter, since the two versions aren't portable between machines. At the moment Cartridge Basic is unavailable on disk and can't be run on any machine other than Junior. And there's a smug little intercept in Junior that keeps you from loading either Basic or BasicA from the DOS 2.1 disk; the intercept displays a message reminding you that you've got to have the cartridge.

Eventually some bright hacker may come up with a way to patch around that intercept, but, at the moment, owners of 128K PC*jr*s might just as well forget about those other two Basics; presumably they're on the DOS 2.1 disk only for the benefit of those IBM PC owners who want to switch from 2.0 to 2.1. However, if you're familiar with Disk Basic or BasicA and you expect to be doing some work on the PC*jr*, you may find it useful to be aware of the differences between versions.

Most of the changes relate to graphics and tone-generation; they're there to take advantage of the 128K Junior's enhanced color palette and ability to produce polyphonic sound output. But there are some other modifications as well.

The instructions that are new in Cartridge Basic or have been changed for it are

CLEAR
COLOR
NOISE
PALETTE
PALETTE USING
PCOPY
PLAY
SCREEN
SOUND
TERM

Terminal Emulation. One of the handiest changes in Cartridge Basic is the addition of a *term* statement. This instruction lets you load and run a terminal-emulation program for use in communications. The terminal-emulator program, which is included in the Basic cartridge, supports RS-232 communications either through the PC*jr*'s internal modem or through its serial communications port.

When you execute *term* (either in immediate mode or from a Basic program), all open files are closed, the Basic workspace (including any programs you might be writing at the time) is erased, and the emulator program displays a menu that lets you change your communications parameters. You can change the transmission speed to either 30 or 480 characters per second, the number of data bits to seven or eight, and the parity to odd, even, or none. You can also select local echo (so that transmitted characters are displayed on your own screen) and a screen width of forty or eighty columns. Once made, these selections remain in effect until you turn off the machine or invoke *term* again.

Term allows you to match your PC*jr* communications with any of the common protocols and will spare you from having to write a special comm package for interfacing with your local bulletin boards or with any of the large commercial networks.

Tone-Generator Statements. The changes in Cartridge Basic that relate to the tone generator include the addition of a new statement called *noise* and the ability to create multiple tones, or "voices," by means of the *sound* and *play* statements.

Noise is used to produce a staticlike sound from an external speaker and expects three parameters: source, volume, and duration.

The source parameter, which controls the type of sound generated, can be any number from 0 to 7. Numbers 0 through 3 produce a periodic sound, while numbers 4 through 7 produce a "white noise" effect. The first numbers in each set (0 and 4) produce a high pitch with a slight hiss. Numbers 2 and 6 produce a low pitch with more hiss, and 1 and 5 are somewhere in between. Each of the selections—except 3 and 7—takes its pitch from the system clock. The source pitch for 3 and 7 is the frequency of the tone set up in voice number 3 with *play* or *sound* (more about these later).

Volume can be any number from 0 to 15, and duration can be from 0 to 65,535 (the duration is expressed in clock ticks, which are produced at a rate of 18.2 per second). You have to include both of these parameters in your *noise* statement, and you must also execute a *sound on* statement before you attempt to use *noise*. If *sound* has not been set *on* you will get an illegal-function error.

This ability to set *sound on* and *off*, also new with Cartridge Basic, means that you can create periods of silence simply by turning off the tone generator. Disk Basic does not have *sound on* or *sound off* and requires that you create pauses by generating a frequency above the normal hearing threshold.

The other important new power given to you by the Cartridge Basic tone-generator instruction set is the ability to create multiple-voiced sound output. Both the *play* and *sound* statements let you generate up to three voices at once, but the two statements do this in different ways.

To create polyphony with *sound*, you must enter one statement line for each voice you wish to produce. *Sound* has two required parameters, frequency and duration, plus two optional ones, volume and voice. The voice parameter can be 0, 1, or 2 and specifies which voice you want to use; if you omit this parameter, the system assumes voice 0, the first voice. If, for example, you want to generate a C above middle C for roughly one second, using the second voice, you enter *sound* 523.250,18,15,2 (a pitch of 523.250 Hz lasting 18 clock ticks at volume 15 in voice 2). Incidentally, the IBM Basic manual incorrectly identifies this frequency as middle C. The volume parameter is not required, but if you want to specify a voice without specifying a volume you have to bypass the volume field by means of a comma, like this: *sound 523.250,18,,2*.

```
10 REM ** HARMONY.BAS ***
20 REM ** sound test for  **
30 REM ** the PCjr 3/5/84 **
40 REM *********************
50 REM
60 T1$ = "L4AAAA>CC<A.AA>CDL2E."
70 T2$ = "L4GGEECC<AAAA>CCC<L2A.P8"
80 SOUND ON
90 CLS
100 PRINT "VOICES IN HARMONY — TEST"
110 PLAY "MBO1T150","O2T150","O3T150"
120 FOR L = 32 TO 4 STEP -4
125 PLAY T1$
126 PLAY T2$,T1$
127 PLAY T1$,T2$,T1$
128 PLAY T2$,T1$,T2$
150 NEXT L
160 GOTO 120
170 END
```

Figure 1.

Play, unlike *sound*, allows you to specify in a single statement the notes you want to play for each voice. All you have to do is separate the strings with commas. Remember that *play* plays a string of notes (identified by their alphabetic names), while *sound* produces individual tones (specified by frequency). *Play* will accept a string of notes in variable form; *sound* will not. Figure 1 shows a short program that creates a tune in three voices. Notice how the voices are separated in the *play* statement lines.

As the figure shows, Cartridge Basic makes it remarkably simple to play tunes in three voices. As each program line is executed, the notes are loaded into their respective voice buffers and played. Line 120 specifies the first voice as "MB"—*music background*. This ensures that the notes will continue to play while the other program lines are executed. The default for *play* is "MF"—*music foreground*; under this setting the notes are not buffered ahead and consequently do not play continuously.

Graphics Statements. The main impact of Junior's sixteen-color medium-resolution palette is on the *screen* statement, which now has seven modes instead of three. In Disk Basic for the PC, the screen modes are 0 (text), 1 (medium resolution, four colors), and 2 (high resolution, two colors). In Cartridge Basic the screen modes are

0—Text mode at forty or eighty columns (sixteen colors)
1—Medium-resolution graphics (four colors)
2—High-resolution graphics (two colors)
3—Low-resolution graphics (sixteen colors)
4—Medium-resolution graphics (four colors)
5—Medium-resolution graphics (sixteen colors)
6—High-resolution graphics (four colors)

The two additions that stand out in this list are modes 3 and 5, which let you use all sixteen colors at once. Disk Basic does not support low-resolution graphics, and its medium-resolution graphics mode (it has only one) limits you to four colors at a time—three of which must be drawn from one or the other of IBM's predetermined "palettes."

Modes 5 and 6 use a 32K memory "page" for graphics generation, whereas the other modes consume only a 16K page. Before using mode 5 or 6, you must reset your page size with a *clear* statement; otherwise you'll get an illegal-function error. Incidentally, the *clear* command in Disk Basic allows you to set the size of the stack and of Basic's workspace only; in Cartridge Basic, *clear* has been changed to let you set the size of the video page as well.

```
10 REM **** WHEELS.BAS ********
20 REM **** 128K PCjr Demo *******
30 REM **** 2/15/84 jdc  *******
40 REM ***************************
50 REM
60 CLS
70 CLEAR ,,,32768!
80 SCREEN 5
90 KEY OFF
100 REM **** repeating loop ****
110 FOR TONE = 1 TO 7
120   X = 160 : Y = 100
130   X1 = 140 : Y1 = 50
140   GOSUB 310
150   COLOR,TONE
160   GOSUB 190
170 NEXT TONE
180 GOTO 110 ' repeat
190 REM **** BUILD CIRCLES ****
200 LINE (140,80) - (180,120),TONE + 2,BF
210 LINE (65,95) - (140,105),TONE + 2,BF
220 FOR I = 10 TO 78 STEP 3
230  CIRCLE (X,Y),I,TONE
240 NEXT I
250 PAINT (X,Y),TONE + 8,TONE
260 PAINT (141,100),TONE + 7,TONE
270 CIRCLE (X1,Y1),53,TONE + 2
280 PAINT (X1,Y1),TONE,TONE + 2
290 GOSUB 430
300 RETURN
310 REM **** BUILD RECTANGLE ****
320 LINE (70,75) - (250,150),TONE + 6,BF
330 LOCATE 14,12
340 PRINT " COLOR COLOR COLOR "
350 GOSUB 430
360 LINE (20,5) - (300,180),TONE + 4,BF
370 LINE (30,30) - (260,170),TONE + 5,BF
380 CIRCLE (35,100),30,TONE + 8
390 PAINT (35,100),TONE + 8,TONE + 8
400 CIRCLE (35,100),10,TONE + 3
410 PAINT (35,100),TONE + 4,TONE + 3
420 RETURN
430 REM **** noisy pause ****
440 FOR P = 1 TO 2
450  SOUND 1046,1
460  FOR N = 1 TO 3
470   SOUND 698.46,1
480   SOUND 32767,1
490  NEXT N
500 NEXT P
510 RETURN
520 END
```

Figure 2.

The remaining fields of the *screen* statement (burst, apage, and vpage) have been changed slightly to accommodate the additional display modes, and an "erase" parameter has been added. Vpage and apage are now valid in all modes, instead of just text mode, and burst is now turned on automatically whenever mode 2, 3, 5, or 6 is used. The erase parameter allows you to specify how much video memory you want to erase; it can be set to 0 (no video erase), 1 (erase the union of the old and new page if the mode or burst changes), or 2 (erase all of video memory on a mode or burst change). If you don't set the erase field, the system assumes 0 and does not erase your video memory.

The program listed in figure 2 shows screen mode 5, preceded by the necessary *clear* statement; it uses the full range of colors available with the enhanced PC*jr*. If you do not have a 128K Junior, you can run this program on a 64K model by eliminating the *clear* command and changing the screen mode to 3 (low resolution).

The second major change to the graphics command set is the addition of the *palette* and *palette using*. *Palette* allows you to change the numbers of the colors in the standard tone range. For example, to change a red line to a blue one you can enter *palette 4,1* and all of the red pixels on the screen will switch to blue. This statement can be used to make objects vanish in games and other graphics displays. To return all colors to their normal number assignments, simply enter *palette* without any other parameters.

The *palette using* statement allows you to use an integer array for assigning more than one color attribute at the same time. By doing this, you can change all or several colors in your palette at once. All you have to do is give *palette using* a sixteen-item number sequence, along with the starting position in the array at which you want resequencing to begin. If you want to leave one or more colors unchanged, enter a −1 for the appropriate position or positions in your array. This method—setting up multiple color-change arrays and executing them in selected sequences—gives you the ability to make drastic alterations to any pattern or picture currently on the screen.

The *color* statement has been changed in Cartridge Basic to let you specify both the foreground and background colors when you're using screen modes 3 through 6. In mode 1 (the same as the PC four-color mode), you're still restricted to selecting a background color and choosing one of the two palettes: green/red/brown or cyan/magenta/white.

Other graphics statements, such as *line*, *circle*, and *draw*, now allow you to select any color from 0 to 15 instead of limiting you to 0, 1, 2, and 3 but otherwise work exactly the same as they do in Disk BasicA. *Paint*, which is used to fill in outlined areas with color, gives you more variation with its "tiling" feature because of the extra colors; but, like *line*, *circle*, and *draw*, it is in other respects unchanged.

Screen copy. Another interesting addition to the PC*jr* Basic instruction set is *pcopy*. This handy little instruction allows you to copy from one screen page to another and is valid in all screen modes, not just the graphics modes. Once you have used *screen* to set the active page and visual page, you can use *pcopy* to move the contents of one page to another. Naturally, the amount of moves and pages you can handle depends on the amount of memory in your machine and on the way you have allocated that memory with *clear*.

The changes and enhancements available with Cartridge Basic make the PC*jr* one of the most powerful graphics tools on the market today. Because of the simplicity of programming in Basic, more and more people are going to find this little machine an ideal addition to the PC family—not just for game playing but also for serious graphics studies by artists, textile designers, stress analysts, and engineers. ▲

THE PUBLIC LIBRARY

BY NELSON FORD

In this department, we look at some classics of public domain software and at some of the new programs and utilities that are sure to become classics.

One recent DOS utility that should make the PD Hall of Fame in short order is *DOS-Edit.com*, by J. Gersbach. The primary purpose of *DOS-Edit* is to store your twenty-five most recently entered DOS commands. To recall one of these commands, you use the up and down cursor keys; just scroll through the list by means of the arrow keys and press Enter to select the command you want to reissue.

If you wish, you may change part of a command before reentering it. For example, say you've just copied a file via the command *copy a:filename.exe b:newname.exe,* followed by *dir b:*. Now you want to copy the file Filename. doc. Press the cursor-up key once and "DIR B:" reappears. Press it again and "COPY A:FILENAME.EXE B:NEWNAME.EXE" appears, with the cursor positioned at the end of the command. Now all you have to do is move the cursor back and change the EXEs to DOCs. This is where the second great feature of *DOS-Edit* comes in.

The cursor control keys work just as they do in Basic and in most word processors. The cursor-left key moves the cursor back over a character without erasing it; Home moves the cursor to the beginning of the command line without erasing the line; and End jumps it to the end of the line again. Control-left-arrow and control-right-arrow move the cursor a word at a time. Control-End deletes characters from the cursor to the end of the line, just as in Basic, but here's an added feature: Control-Home deletes from the cursor to the start of the line. Normally, pressing Escape in DOS puts a slash where the cursor was and moves the cursor down a line. With *DOS-Edit,* the escape key functions in a more sensible manner: It clears the line. The Insert and Delete keys also function the way they would've had you written DOS yourself. A full-screen-edit version of *DOS-Edit* is supposed to be available by the time you read this.

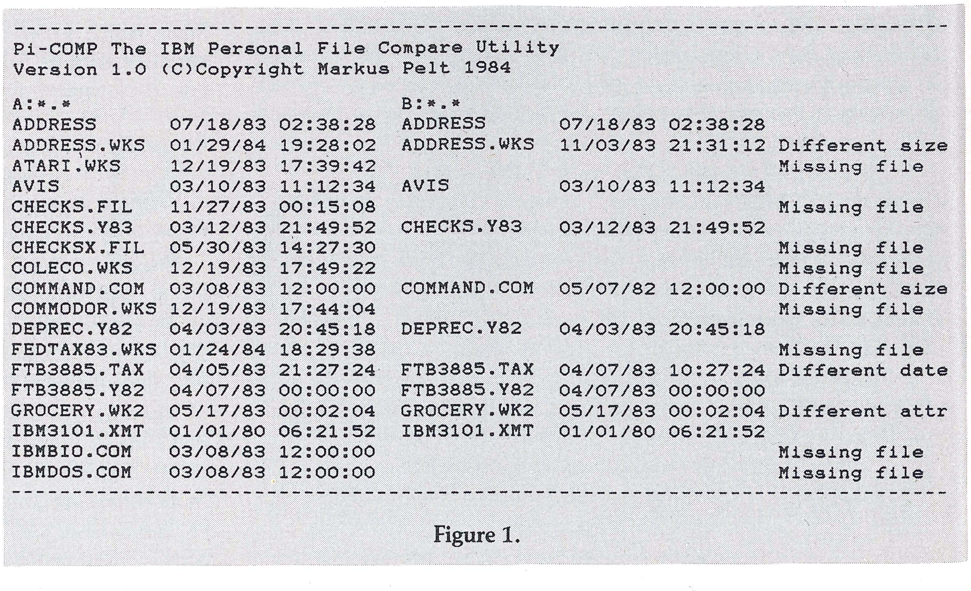
Continuing with our example, press control-left-arrow until you reach the first EXE and then type *DOC*. Press control-right-arrow to the second EXE and type *DOC* again and your command line will say COPY A:FILENAME. DOC B:NEWNAME. DOC. Now you can press Enter and execute the command.

In this example, your cursor will wind up at the end of the line when you finish making changes, but it doesn't have to be there. Whatever is displayed on the screen is executed when you press Enter, no matter where the cursor may be within the command.

Another very useful utility is *Pi-comp*, by Markus Pelt. This utility replaces DOS's file comparison command, but it can also be used to compare two disks. Figure 1 shows what you would see if you entered the command *picomp a: *. * b: *. *.*

The copyright notice in figure 1 brings up an interesting point. Many PD authors are willing to share their work with other PC users but don't want to see their work sold by others for profit; in such cases, the author adds a copyright notice but allows users to copy the program on a not-for-profit basis.

Public Domain for Basic Programmers
Basic programmers can find quite a few useful utilities in the public domain. Among the "classics" are three categories of utility: crossreferencers, program listers, and program



```
---------------------------------------------------------------------------
Pi-COMP The IBM Personal File Compare Utility
Version 1.0 (C)Copyright Markus Pelt 1984

A:*.*                          B:*.*
ADDRESS      07/18/83 02:38:28 ADDRESS      07/18/83 02:38:28
ADDRESS.WKS  01/29/84 19:28:02 ADDRESS.WKS  11/03/83 21:31:12 Different size
ATARI.WKS    12/19/83 17:39:42                                Missing file
AVIS         03/10/83 11:12:34 AVIS         03/10/83 11:12:34
CHECKS.FIL   11/27/83 00:15:08                                Missing file
CHECKS.Y83   03/12/83 21:49:52 CHECKS.Y83   03/12/83 21:49:52
CHECKSX.FIL  05/30/83 14:27:30                                Missing file
COLECO.WKS   12/19/83 17:49:22                                Missing file
COMMAND.COM  03/08/83 12:00:00 COMMAND.COM  05/07/82 12:00:00 Different size
COMMODOR.WKS 12/19/83 17:44:04                                Missing file
DEPREC.Y82   04/03/83 20:45:18 DEPREC.Y82   04/03/83 20:45:18
FEDTAX83.WKS 01/24/84 18:29:38                                Missing file
FTB3885.TAX  04/05/83 21:27:24 FTB3885.TAX  04/07/83 10:27:24 Different date
FTB3885.Y82  04/07/83 00:00:00 FTB3885.Y82  04/07/83 00:00:00
GROCERY.WK2  05/17/83 00:02:04 GROCERY.WK2  05/17/83 00:02:04 Different attr
IBM3101.XMT  01/01/80 06:21:52 IBM3101.XMT  01/01/80 06:21:52
IBMBIO.COM   03/08/83 12:00:00                                Missing file
IBMDOS.COM   03/08/83 12:00:00                                Missing file
---------------------------------------------------------------------------
```

Figure 1.

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compressors. In any large PD software collection, you'll probably find half a dozen or more of each.

A cross-reference utility lists all the variables in your program, showing on which line(s) each variable appears. Some versions also list each place a line number is referenced by a *goto* or *gosub*. (Most Basic cross-reference programs credit an article in *Byte* for their origins.) A program lister gives you a neat listing of your program, putting a heading on each page and adding other cosmetic touches. A program compressor removes extraneous spaces and remarks to make your program more compact; this causes the program to consume less memory and to run faster.

Early programs of these types required that your Basic program be saved to disk in ASCII; you then loaded the utility, which opened your program file and read it as if it were an ordinary data file. Saving programs in ASCII takes substantially longer than saving them in compacted (tokenized) binary. A program that takes only seconds to save in binary form may take minutes in ASCII (and it seems much longer while you're sitting there waiting).

A recent PD cross-reference program works on files saved in binary. It takes advantage of the fact that variable names are not tokenized when the program is saved in binary. (Basic tokenizes reserved words, numbers, and symbols but leaves variable names and string literals alone.) All the utility has to do is decode the line numbers (fairly easy to do) and read the variable names, ignoring any tokens. Because you don't have to save your program in ASCII, this cross-referencer is much more convenient to use than earlier ones.

There's a public-domain utility called *Readbas.bas* that can be added to program listers and compressors to allow them to read and work on programs saved in binary. Perhaps this approach will put an end to the bothersome requirement that programs be saved in ASCII.

One of the better PD cross-references, one that also can compress and expand programs, is *Basicaid.bas*, by James P. Morgan (1749 Americana Boulevard, #23G, Orlando, FL 32809). This is not only a fine utility to have in your library but also an unusually well-commented one, from which novice programmers can learn. We'll look at another of Morgan's efforts shortly.

Another useful kind of utility for Basic programmers is a file-comparison program. Let's suppose you've been working on a program and have saved it to two different disks. You think that you made some changes in the program on one disk and, accidentally, made different changes in the version on the second disk—unaware that you weren't editing the latest version of your program.

DOS's file comparison program will tell you that your files don't match, but that's all the information you'll get. Using *FC.bas*, or one of the other similar file-comparison programs, you can compare the two files and be shown any lines that don't match. Some versions will create a third file, allowing you to select which of two nonmatching lines to put into the new file.

Other New Programs and Utilities

Prgtim, by Steve Kent, is a set of utilities that log the amount of time spent by multiple users of a computer; the utilities also keep track of the areas of usage.

List.com version 1.4, by Vern Buerg, is a utility to replace DOS's *type* command. Version 1.3 was reviewed here last month, and certain enhancements were suggested. This new version has everything you could want. In addition to paging through a file a screen at a time, you can scroll up and down a line at a time, search for specified text, and zip to the beginning or end of the file. This utility is a must-have.

Scaven.com checks all the sectors on a disk and adjusts the File Allocation Table to lock out any sectors found to be bad. This keeps DOS from trying to write to the bad sectors. With a floppy disk, you're probably better off just throwing away the disk; but if you use a hard disk, this utility can save you lots of headaches.

The Contest Continues

The search is still on for a catchy name for quasi-public-domain, pay-only-if-you-like-it software. Many people have suggested *Shareware*. That's a descriptive and catchy name, but it's already in use by the authors of *PC-Write*, a quasi-PD word processor. Jon Shoemaker of Charlotte, North Carolina, came up with the name *Conscience-Wear.* He explains, "The longer you use the software, the more it *wears* on your *conscience* if you do not pay." But the current winner is Joe Pehoushek of Cincinnati. He suggests *Tryware*, which is about as close as you can hope to come to a one-word description of the QPD concept. I will be using *Tryware* until someone comes up with something better.

Contribute to The Public Library

If you've written a program that you'd like to share, send me a copy on a disk. Any disk of original PD software sent to me will be returned with new PD software on it. Individuals or groups who swap or sell PD software at cost can be listed here by sending a description of their libraries and how people can get software from them. Be sure to mention all costs, including postage and handling.

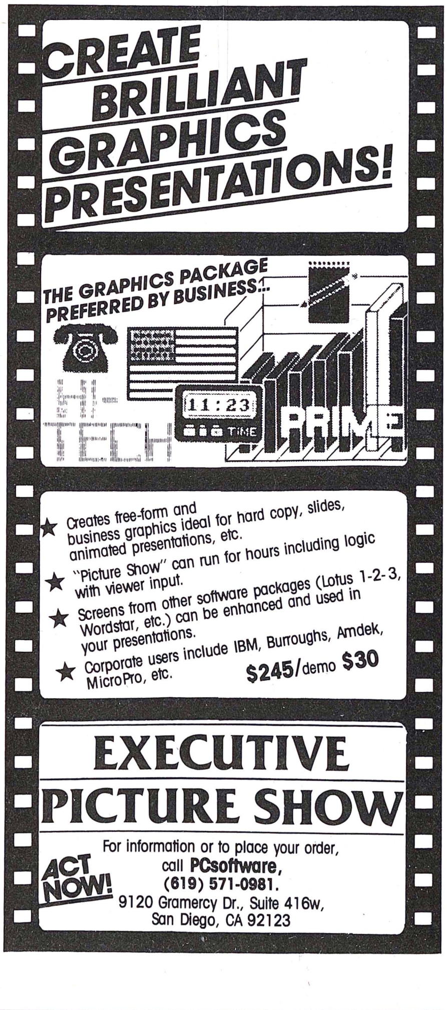
Where To Get PD Software

To get the programs mentioned in this column, try your local user group. The Ridgefield, Connecticut, group has an extensive library. They use double-sided disks exclusively and sell them for $5 apiece. A printed catalog with program descriptions can be had for $3 from Norris Couch, 46 Blackman Road, Ridgefield, CT 06877.

PC-Sig sells public domain software for $6 a disk plus a $4-per-order handling charge. Most disks are single-sided. A printed catalog is $4.95. PC-Sig's address is 1556 Halford Avenue, Suite 130, Santa Clara, CA 95051.

Most of the programs mentioned here can be found on CompuServe and other bulletin boards. If you cannot find them anywhere else, you may send me a double-sided disk with a prepaid mailer and $2 per disk to cover copying and handling expenses; send $7 per disk if you want me to provide the disks, mailer, and postage. The Basic utilities in this month's column require two disks. Send letters and disks to Nelson Ford, Box 61565, Houston, TX 77208. ▲

Nelson Ford is a worker at the public domain library in his area. He is also author of the disk file catalog program Diskcat *and the book,* Business Graphics on the IBM PC, *published in April 1984 by Sybex.*



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Spring Comdex

Computer Pow-Wow in the Home of the Braves

The 1984 Spring Comdex took place May 22 through 25 in the beautiful city of Atlanta, a setting that presented a welcome contrast to the fleshpots of Las Vegas (Fall Comdex) and the ozone of Los Angeles (Winter Comdex). Cigarette and beer billboards were displaced by giant outdoor advertisements for spreadsheets and PC look-alikes. The sidewalks for blocks around were patrolled by flunkies giving out fliers, newsletters, and contest entry blanks. More than 40,000 attendees cruised the aisles in search of the latest and greatest in computers and accessories, then whiled away their evenings at sumptuous private parties held at ante-bellum Southern mansions and high-priced restaurants. Peach daiquiris flowed like tap water, and for four days all was well with the world.

By Ray Duncan

At least, that's the impression you may have formed from reading the coverage in the weekly computer press. The coverage is accurate, as far as it goes.

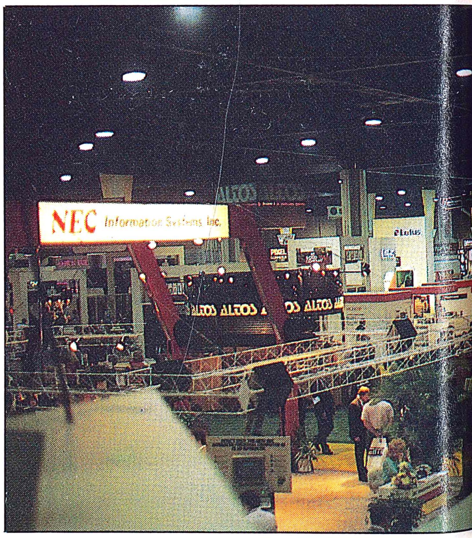
In reality, of course, these trade shows are all very similar, with the same companies showing the same products from the same booths. I mean, how many word processors and "relational" databases does the world really need, anyway? And do colored floppy disk jackets, "smart" RS-232 cables, and lockable diskette cases really constitute technological advance? The mind simply boggles at the amount of money being spent to market products that distinguish themselves by nothing more than catchy names or snazzy advertisements.

Lest you think that the Spring Comdex went nowhere and took this article along with it, I must confess that, after surveying the 800-plus exhibitors in the show with my gimlet eye, I did spot a number of new products that might interest *Softalk* readers.

IBM, in two enormous booths, was prominently displaying the new color printer for the PC, a new line of easy-to-use software called the *IBM Assistant Series* (a revised and enhanced version of Software Publishing Corporation's PFS series), and an impressive PC*jr* adventure game called *King's Quest* that includes animated 3-D graphics. A color monitor for the PC*jr*, with excellent styling and resolution, was also on display; this will be available soon—for less than $500.

IBM also demonstrated its "Cluster"—with diskless and full-blown PC*jr*s, PCs, PC Portables, and XTs all sharing an XT hard disk; the Cluster's performance was better than I expected. The IBM salesmen continued to defend adamantly the PC*jr*'s keyboard, and the ones I talked to all insisted that IBM has no plans to release an alternative.

Once again, IBM's OEM booth was showing the company's superb 581 flat plasma display. This device generates an incredibly crisp orange-on-black image with a resolution of 768 by 960; it was being driven by a prototype interface board in an IBM PC. The software, said to be experimental, was an icon-oriented graphics sketchpad controlled by light pen and keyboard (rather than by mouse) but otherwise was very similar to the much-discussed *MacPaint*. Let's hope that IBM sees fit to bring



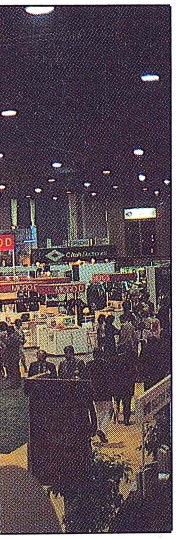
this product to the retail market in the near future.

MS-DOS lap computers were announced by the bushel and were one of the particularly hot items at this Comdex. I was especially impressed with the "Pivot" from Morrow. This is a nifty portable that combines a high degree of PC compatibility (it will boot and run standard PC-DOS), 128K, a flat sixteen-line-by-eighty-column LCD display, a built-in modem, a clock, a calculator, and a half-height 5 1/4-inch disk drive in a nine-pound package for around $2,500.

Hewlett-Packard drew droves of showgoers with its new $2,995 "Nomad" (model 110) portable. As is typical of H-P products in general, the Nomad combines classy styling with rock-solid, state-of-the-art engineering. It contains some 384K of software in ROM—including MS-DOS, Lotus *1-2-3*, and a terminal emulator, plus 272K of RAM that can be partitioned between system memory and electronic disk. You can buy a plug-in 3 1/2-inch disk drive and a ThinkJet printer for your Nomad (both may be battery-powered), or you can get an attachment allowing you to transfer files between the portable and your IBM PC or H-P 150 desk computer.

H-P was also showing its new LaserJet printer, which sells for only $3,500 and which is going to put some pressure on the typesetting industry. Offering a resolution of 300 dots per inch, output of eight pages per minute, programmable fonts, and an RS-232 interface, the

(Top left) There's no business like computer show business. . . .(Top right) Ashton-Tate and Lotus went head to head with their new products, "Framework" and "Symphony." (Bottom left) More than 800 exhibitors set up shop for 40,000-plus attendees during the four-day show. (Bottom right) Alloy Corporation's PC Coprocessor Boards allow one PC to run many CRT terminals at once.



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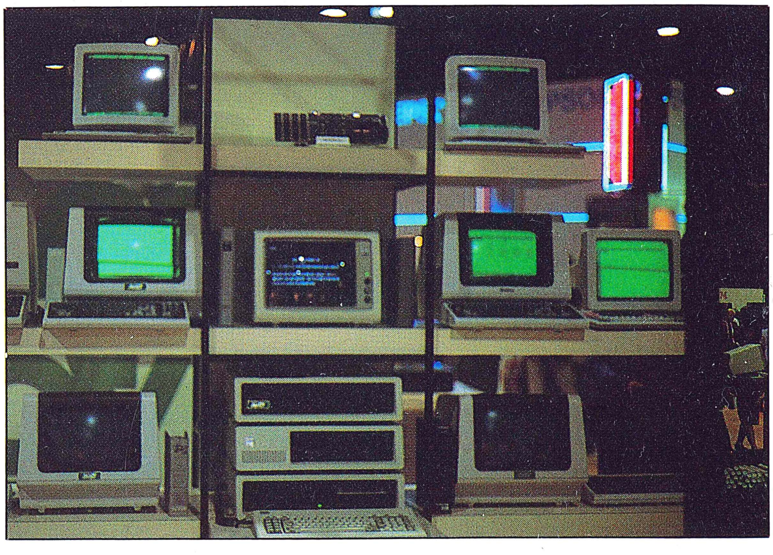

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LaserJet is compatible with virtually every personal computer. Microsoft has already announced a LaserJet printer driver for *Word*. Unlike most previous H-P products, the Nomad, ThinkJet, and LaserJet will all be available—competitively priced—through your local computer store.

But both Pivot and Nomad are only harbingers of much better things to come. The rapid decline in disk drive and RAM prices and the already announced advances in display technology make much-higher-performance machines inevitable in the very near future. By the end of the year, we should see MS-DOS lap computers weighing less than ten pounds and based on the 80188 or 80186; they'll include a

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(Top) For four days in June, Atlanta, Georgia, played host to the computer masses for Spring Comdex. (Bottom) "MousePaint," from Mouse Systems, brings the capabilities of Apple's "MacPaint" to the PC. "MousePaint" is scheduled for a September release.

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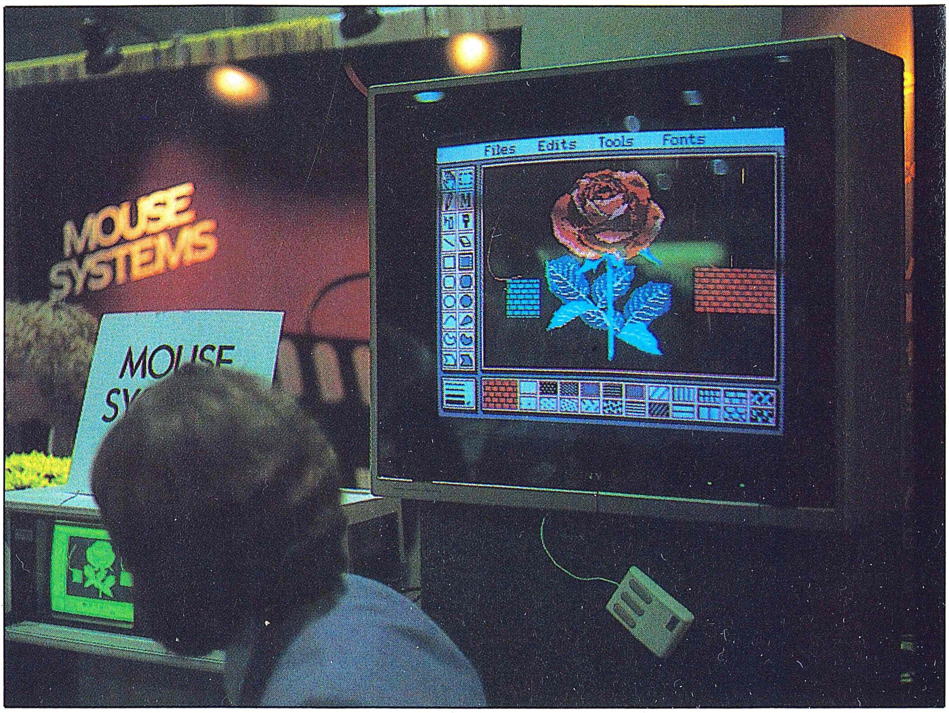

full megabyte of RAM, 1200-baud autodial modem, one or two 3 1/2-inch disk drives, and a twenty-five-line-by-eighty-column flat display. Peering deep into my crystal ball, I predict that Compaq and Hewlett-Packard will be on the cutting edge of these developments. I further predict that the companies that get there first will have to buy a whole fleet of armored trucks to carry all that cash to the bank.

Under the heading of wringing more performance out of your existing computer, both Alloy Computer Products and PC Technologies demonstrated coprocessor boards that plug into your PC and allow you to hang one or more additional terminals on the back. Since each board has its own CPU and RAM, performance is excellent, unless more than one program is making heavy use of the disk. The advantages these two products have over the IBM Cluster are that they will work with ordinary CRT terminals and with hard disks other than the XT's.

For every interesting new piece of hardware at Comdex, however, there were ten "clones" with nothing new to offer. Televideo, Sperry, NCR, Texas Instruments, NEC, Eagle, Burroughs, Corona, and Olivetti (to name but a few) were all proudly showing personal computers whose only reason for existence was IBM PC compatibility. It's nice that IBM has brought some semblance of standardization into the microcomputer marketplace, but it's also kind of sad to see formerly innovative manufacturers now following dutifully in IBM's footsteps.

No "me-too" products from AT&T, though. What remains of Ma Bell was at Comdex with a massive line of thirty-two-bit computers that are incompatible with everything else ever built. AT&T disdains joining the rest of the computing fraternity in the main exhibit hall, instead putting on a gigantic exhibit in a private room isolated from all other vendors. Legions of dapper salesmen were there to take down your name and address but couldn't even give you a ballpark price of the equipment they were standing next to—let alone a delivery date. When questioned about technical matters, they resorted to generalities and hand-waving. Methinks AT&T still has a few things to learn about selling computers in this cruel world.

In the software arena, Microrim's *R:base*, Ashton-Tate's *dBase III* and *Framework*, and Lotus's *Symphony* were going head to head for the big bucks. At the Lotus booth, *1-2-3* was seen running on a Macintosh and a PC*jr*, while enthusiastic dealers snapped up the *Symphony* update forms. Across the aisle, Microrim was demonstrating *Clout*, its interesting natural-language database "front end" (which can adapt itself to the user's vocabulary).

Although the dominant software packages on exhibit clearly were databases and spreadsheets, telecommunications programs followed close behind. I was particularly charmed by Menlo Corporation's highly specialized *In-Search* program, which gives the user painless access to any of the 200-plus databases on Lockheed's "Dialog Information Services" system. Effective use of Dialog has previously required the patience of a saint, the mind of a logician, and the temperament and stamina of a librarian, not to mention "deep pockets" during the learning period. With *In-Search* you may formulate your database search off-line in a very natural, interactive manner, then sit back and relax while the program searches out a local nonbusy access number, dials up Dialog, feeds it the inquiry in terms it understands, transfers the results into local storage, and hangs up the phone! A neat program that deserves to be highly successful.

As I return to reality here in the back room, pounding away on my faithful old PC's keyboard, I can happily recommend Atlanta as a great place to visit. The city fathers even have a sense of humor, as evidenced by the synthesized voice announcements on the airport tram that sound exactly like the *Robotwars* video arcade game. Attending Spring Comdex is an effective way to keep tabs on the state of the personal computer industry. But I'm saving my quarters and building up my endurance for the great-granddaddy of all shows, the Fall Comdex at Las Vegas. More than 80,000 people usually attend—so if you're interested in joining them, it's not too early to make your reservations! ▲

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THE C SPOT

by *Rex Jaeschke*

More on Pointers

Last time, we stated that the name of an array is really a pointer containing the address of the first element in that array. While it's true that an array name can be used to point to the start of the array it names, the name itself isn't a true pointer in the C sense. A pointer is a variable, and therefore its value may change. This means that a pointer can point to different objects (of the same type) at different times in the course of a program.

In C, once an array is defined and space has been allocated for it (either at compile time or at run time), the address of that storage area remains constant. That is, the address of the start of the array is a constant and the array name points to that constant address. Although the array name behaves like a pointer, its value can't be changed. The following example shows an array name being used illegally as a pointer.

Here we are attempting to change the address that the array name *ca* points to.

```
/* Illegal usage of array name as a pointer. This
   function should produce compilation errors. */

main ()
{
      char ca[10],cc;

      ca = "Hello there";
      ca = &cc;
}
```

The *strcpy* Function. The *strcpy* function typically is supplied in the compiler runtime library. It can be written easily as follows:

```
/* point4.c - demonstrate the use of strcpy */
main ()
{
        char string[30];
        strcpy (string,"The C Programming Language");
        printf ("string contains -->%s<--\n",string);
}
/* strcpy.c - the strcpy library function */
strcpy (dest,source)
char *dest,*source;
{
        while (*dest++ = *source++)
                ;
}
```

The output produced by this code is

```
string contains -->The C Programming Language<--
```

The *strcpy* function copies a *char* string (including a trailing *0*) to another *char* string. It expects its arguments to be pointers to the destination and source strings. A literal string is treated by the compiler as a static *char* array. Although the addresses of literal strings can't be determined with the *&* unary operator, the use of such strings as arguments to functions causes their addresses to be passed. Therefore, both the array name *string* and the literal string "The C Programming Language" cause a pointer to be passed to the called function.

*char *dest,*source;* declares both arguments to be pointers to *char* strings. The expression **dest++ = *source++* causes a character to be copied from the address to which *source* points to the address to which *dest* points. Then both pointers are incremented so that they point to the next addresses in their respective strings.

If the *char* copied is not a *0*, then the expression is true, and the *while* loop is repeated. When a *0* is detected in the *source* string, it is copied to the *dest* string, the expression is false, and the *while* loop is terminated. All the work is done in the *while* expression. However, the *while* construct requires a statement body, so the null statement (;) must be used.

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Let's look at a version of the *strcpy* function that uses character arrays rather than *char* pointers.

```
/* --- strcpy1.c - character string version --- */
strcpy (dest,source)
char dest[],source[];
{
            int i;
            i = 0;
            while (dest[i] = source[i])
                    ++i;
}
```

To programmers new to pointers, this version may make more sense. However, it requires the creation and initialization of the temporary variable *i*. *i* must be incremented separately, as neither *dest[i++]=source[i]* nor *dest[i]source[i++]* guarantees the correct result. Remember, your C compiler, like most other compilers, makes no promises about the order in which it evaluates such expressions.

One warning about *strcpy*. It is your responsibility to ensure that *dest* points to a storage space large enough to accommodate the string pointed to by *source*. If *string* were defined in *main* as *char string[5];*, *strcpy* would faithfully copy the whole source string, in the process overwriting some memory locations beyond the end of *string*.

Consider the two constructs *while (dest[i]=source[i])* and *while (dest[i]==source[i])*. Note that one involves an assignment, while the other is an equality test. The two have quite different meanings. Sometimes it's hard to see the forest for the trees when you're looking at such expressions; if you've used the wrong one in a particular instance, that error may not be immediately apparent.

We've seen an example of using the increment operator ++ with a *char* pointer. Now we'll look at decrementing a double pointer.

```
/* point3.c - pointers and double arrays */

double da[] = {0.0,1.1,2.2,3.3,4.4,5.5};

main ()
{
   double *pd   /* define pointer to double */

   pd = &da[5]; /* point to last element of array */
      while (*pd > 0.0)
        printf ("%6.2f\t",*pd--); /* print array
                                     element */
      putchar ('\n');
}
```

which produces the following output

```
     5.50     4.40     3.30     2.20     1.10
```

The _*pd--_ expression is similar to the _*pc++_ we saw earlier. In this case, the double-precision value pointed to by *pd* is printed using the edit mask *%6.2f*, and then the pointer *pd* is decremented to point to the previous double value in the array. This continues until an element with value 0.0 is found.

The example stops when it gets to the first element, *da[0]*. Consider the case where you want to print that element as well. A commonly suggested way of doing this is to change the loop test criterion to *while* _(*pd)= 0.0)_. Nice try but no cigar. Let's see what happens when we run this with one compiler.

```
5.50  4.40  3.30  2.20  1.10  0.00  0.00  0.00  0.00
```

We got the first element and a few other numbers as well. Where did they come from? Remember, C does no runtime checking of array bounds; there's no way to check to see if a pointer such as *pd* is incre-

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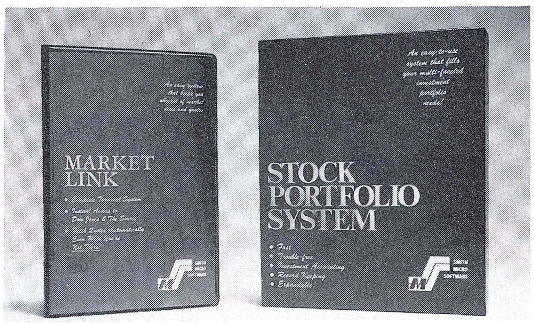

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mented or decremented beyond an array's bounds. The reason we see three extra lots of 0.0 printed is that, by chance, that's what was stored in the twenty-four bytes (three double values) in memory located immediately before the storage area that contained the array *da*. To process all elements in an array, you must know the number of elements in that array or know the first or last element values. The only exception is when *char* arrays are being processed in the forward direction; in that case the array end is signaled by the trailing *'\0'*.

More Useful Functions. By now you are no doubt pointered out, so let's look at a few simple functions that will prove useful additions to your software toolbox.

```
/****************************************************/
/* isodigit.c - returns TRUE if input chr is an octal
                digit, else returns FALSE */
isodigit (chr)
char chr;
{
        return (chr >= '0' && chr <= '7');
}
/****************************************************/

/* isxdigit.c - returns TRUE if c is a hexadecimal
                digit; else returns FALSE */
isxdigit (c)
char c;
{
  return(isdigit (c)||(c >= 'A'&&c <= 'F')||
  (c >= 'a'&&c <= 'f'));
}
/****************************************************/

/* iscntrl.c - returns TRUE if input chr is an ascii
                control code; else returns FALSE */
#define NULL 0
#define SPACE ' '
#define DEL 0x7f            /* ascii delete character */
iscntrl (chr)
char chr;
{
   return ((chr >= NULL && chr < SPACE) || chr == DEL)
}
/****************************************************/

/* isprint.c - returns TRUE if input chr is printable
                ascii; else returns FALSE */
#define SPACE ' '
#define DEL 0x7f            /* ascii delete character */
isprint (chr)
char chr;
{
        return (chr >= SPACE && chr < DEL);
}
/****************************************************/


/* ispunct.c - returns TRUE if input chr is a
               punctuation character (includes
               a space); else returns FALSE */
ispunct (chr)
char chr;
{
   return (isascii (chr)&&!(isalnum (chr)||
   iscntrl (chr)));
}
```

ispunct () uses the logical negation operator *!*. If *abc* is true, then *!abc* is false—and vice versa.

```
/****************************************************/
/* iswhite.c - returns TRUE if input chr is space,
               tab, end-of-line, or newline;
               else returns FALSE */
#define SPACE ' '
#define TAB '\t'
#define EOL '\r'
#define NEWLINE '\n'
iswhite (chr)
char chr;
{
  return (chr == SPACE||chr == TAB||chr == EOL||
  chr == NEWLINE);
}
```

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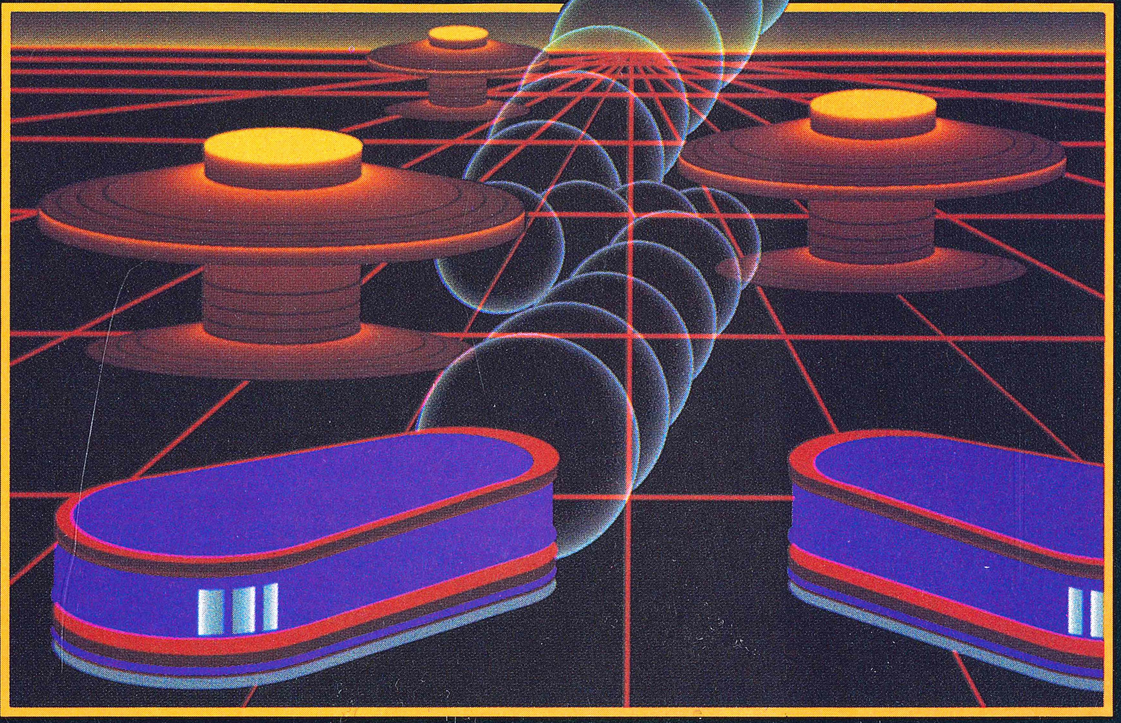

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```
/****************************************************/
/* tolower.c - if chr is uppercase alpha return
                lowercase version of chr;
                else return chr unchanged */
tolower (chr)
char chr;
{
        /* if upper, set bit 5 */
        return (isupper (chr) ? (chr ¦ 0x20) : chr);
}
```

Several new concepts are introduced in *tolower ()*. An expression of the form *exp1 ? exp2 : exp3* is known as a *conditional expression*. If *exp1* is true, then *exp2* is evaluated; otherwise *exp3* is evaluated. Let's look at a version of this function without the conditional expression.

```
tolower (chr)
char chr;
{
        if (isupper (chr))
                return (chr ¦ 0x20);   /* set bit 5 */
        else
                return (chr);
}
```

¦ is the bitwise inclusive OR operator. Now *0x20* is a hexadecimal constant whose binary value is 100000. *(chr ¦ 0x20)* causes the sixth bit in *chr* to be set to 1. On many machines, bits are numbered from right to left, starting at 0; on such machines the sixth bit is bit number 5. If you consult a chart of ASCII character codes, such as that in Appendix G of the IBM BASIC manual, you'll see that the ASCII value of any uppercase letter is thirty-two less than that of its lowercase counterpart. If you take any letter and compare its binary values for both upper and lower case, you'll see that the only difference is that bit 5 is set in the lowercase version and clear in the uppercase version. Therefore, we can convert from upper case to lower case and back by setting or clearing bit 5. Note that this method is guaranteed only for the ASCII character set.

¦ should not be confused with the logical OR operator ¦¦. ¦, which can be used only with integer types, results in an integer value. ¦¦ can be used with any type of expression and returns either true or false.

```
/****************************************************/
/* toupper.c - if chr is lowercase alpha, return
                uppercase version of chr;
                else return chr unchanged */
toupper (chr)
char chr;
{
        /* if lower,clear bit 5 */
        return (islower (chr) ? (chr & ~0x20) : chr);
}
/****************************************************/
```

& is the bitwise AND operator. During our discussion of *tolower ()*, we saw that it's possible to convert an alphabetic character to upper case by making bit 5 a 0. The expression *(chr & ~0x20)* achieves this conversion. We could have used *(chr & 0xdf)* instead, however, but that method assumes that the size of *chr* is eight bits. *~0x20* produces the correct bit mask for any size of *chr* and is therefore machine-independent.

Like ¦ and ¦¦, & and && are quite different operators and shouldn't be confused with one another. There is also a bitwise XOR operator; its symbol is ∧.

Next time, we'll delve further into pointers and will introduce some more useful functions for your toolbox. ▲

Come in late on "The C Spot"? All back issues of the column—from January 1984—are still available; for further information, see page 4.

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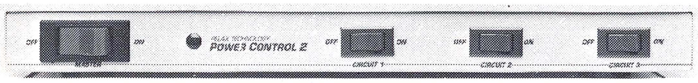

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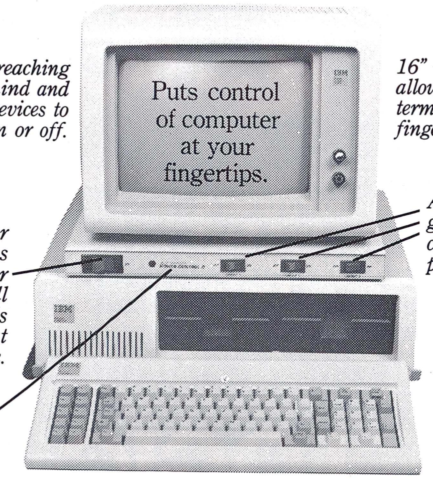
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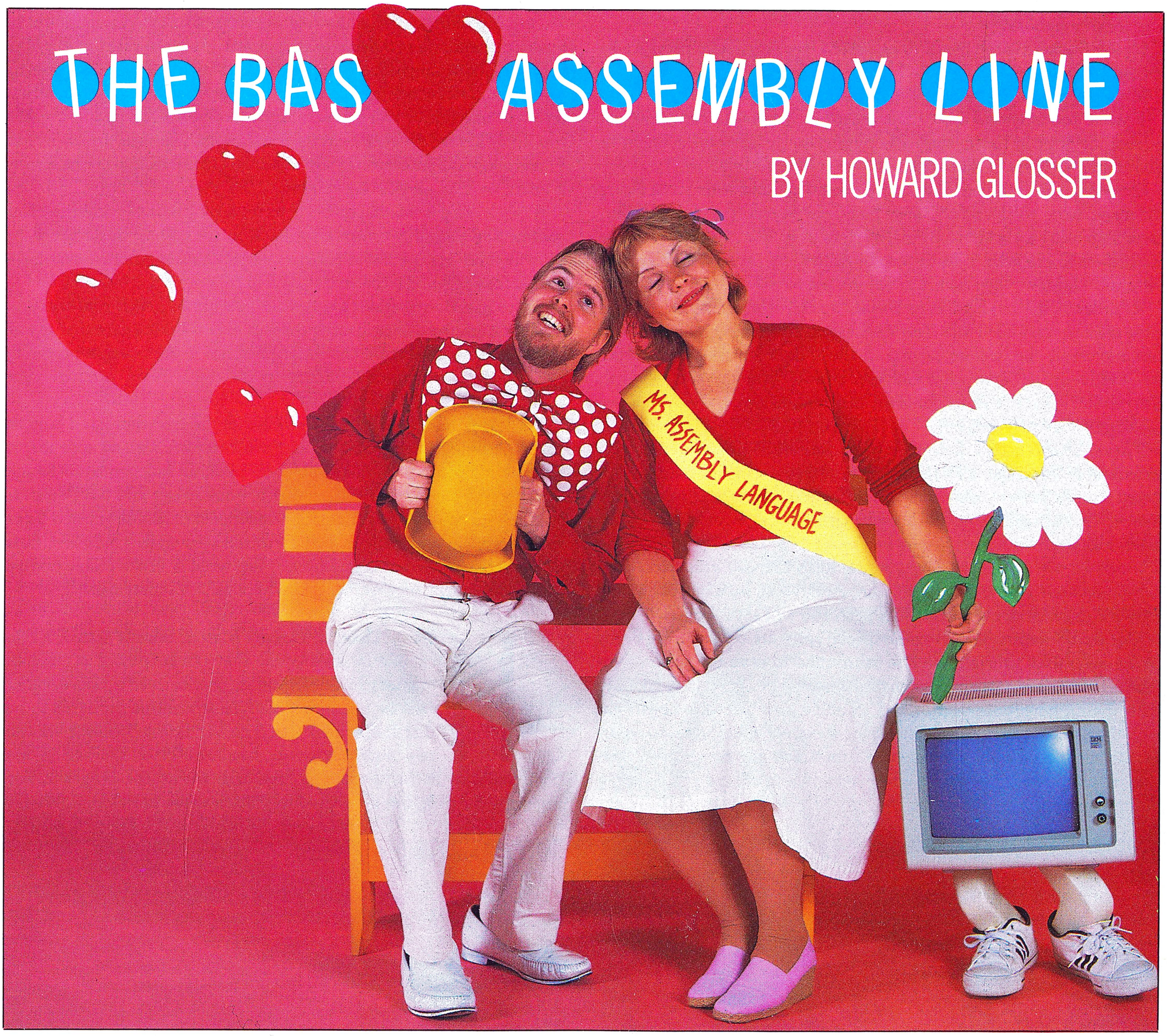
THE BAS♥ ASSEMBLY LINE

BY HOWARD GLOSSER



getting assembler and basic to work together

In the first six articles of this series, we considered the problems and shortcomings of Basic, using an assembly language subroutine to fill some special need we identified.

This time, instead of presenting another subroutine to handle some specific task, we'll consider in general the challenge of making an assembly language subroutine cooperate with Basic. Also we'll rectify an error that crept into the December subroutine for validating filenames and answer some questions that readers have sent in.

Is This a Good Time for an Assembly? Anyone thinking about using an assembly language subroutine with Basic will first want to ask six questions:

1. Is the subroutine useful? Can it do anything that isn't already done in Basic? If it can, will the assembly routine do it faster or better?
2. Is the number of bytes that will need to be expressed as Basic *data* statements manageable?
3. Are there any special hardware or software factors that need to be taken into account for the creation or use of this subroutine?

4. What kind of errors might occur within the subroutine and how will they be handled?
5. What information needs to be passed from the Basic program to the subroutine?
6. Is the subroutine relocatable or position-independent?

If what you intend to do with an assembly language subroutine can already be done in Basic, then it's obvious that your routine ought to do it better or faster. Otherwise, why go to the trouble?

Consider, for example, an assembly language subroutine that clears the screen from within Basic. Since Basic already has the *cls* statement, there's no need for a subroutine that does only that. If, however, the subroutine also allows a window to be defined on the screen and clears only this window, then there's a definite use for it.

In order to be intelligible to Basic, machine language subroutine code must be translated into *data* statements. As the length of a subroutine increases, the task of keying in those *data* statements becomes more arduous. At some point you have to ask, "Is all this typing worth the result?" That's a valid concern; the answer won't always be yes (although it usually will be).

The question of size arises again when we consider coding efficiency. In assembly language, a statement that moves a word of data, as opposed to a single byte, generates two bytes of machine code as opposed to one. This can quickly make a long routine even longer. Be sure your assembler code is as clean as you can make it. If you want to clear the CL register, use XOR CL,CL; if you use XOR CX,CX, you'll create an extra *data* item in your Basic program. And, when possible, use a JMP SHORT in place of a standard JMP; this too will save a byte.

Our third question concerns the special software or hardware needs of the assembler subroutine. The subroutine to save the screen (November 1983) had a hardware constraint; it was designed to work only with the monochrome display. An example of a software constraint would be an assembler subroutine using function calls specific to a particular version of DOS. Unless your subroutine is written for all versions of DOS and checks to see which version is in use, you could find it of limited value.

Question 4 deals with error handling. If the possibility for error exists in your subroutine (and when does it not?), provision should be made for handling problems as they occur. As mentioned in previous columns, it's usually not a good idea to display error messages directly on-screen. That's because the assembly language subroutine in which the error may occur will be running within a Basic program; the subroutine will have no idea what information may already be on-screen. Therefore, if the subroutine were to put an error message on the screen, it might overlay an existing display.

A better way to handle errors is to set a return code within the subroutine and pass this return code back to the calling Basic program. This method lets the Basic program—not the assembly subroutine—decide how to handle the error.

As for question 5, making sure your subroutine gets the information it needs from the calling Basic program means taking care that the arguments are passed from the Basic program in the order expected by the assembler subroutine; failure in this regard can produce catastrophic results.

The last point to consider is the one that the December and January "Basic/Assembly Line" columns did not consider: making sure the assembler subroutine is relocatable or position-independent. Reader Timothy P. Martin of Griffith, Indiana, pointed out that the December Validate subroutine wasn't position-independent and submitted a corrected version; we'll look at that corrected version in a moment. First, however, let's answer the questions, "Just what is a relocatable or position-independent subroutine, and why wasn't Validate one?"

Here or There, It Doesn't Matter. Simply stated, a relocatable module is one that can be placed at different memory locations and still run correctly. Those readers who keyed in the Validate subroutine probably found that it operated fine. The Validate subroutine was not relocatable, however, because at its start it had a variable defined as Retcd, a word-storage area within the program. Any time that the program attempted to place a value in Retcd, it overlaid

```
10'   **** BUILD VALIDATE****
20'  (as modified by T.P. Martin)
30'  A ROUTINE TO VALIDATE FILENAMES &
40'   CALLED FROM WITHIN A BASIC PROGRAM
50'
60'  WRITTEN BY HOWARD GLOSSER
70'
80 CLS
90 PRINT "Creating VALIDATE subroutine. . ." : PRINT
100'
110'**  THIS SETS UP STRING LOCATION FOR SUBROUTINE
120'
130 DEF SEG
140 SUBRT$ = STRING$(128,32)
150 SUBLC% = VARPTR(SUBRT$)
160 VALID = PEEK(SUBLC% + 1) + PEEK(SUBLC% + 2)* 256
170 LCN = VALID
180'
190'** THIS BUILDS THE SUBROUTINE
200'
210 LINENO% = 450
220 FOR STMT = 1 TO 16
230  FOR MEM = 1 TO 8
240    READ DT%
250    POKE LCN,DT%
260    CHECKSUM% = CHECKSUM% + DT%
270    LCN = LCN + 1
280  NEXT
290  READ DT%
300  IF CHECKSUM% <> DT% THEN 410
310  LINENO% = LINENO% + 10
320  CHECKSUM% = 0
330 NEXT
340'
350'** THIS SAVES THE SUBROUTINE
360'
370 BSAVE "VALIDATE",VALID,124
380 PRINT "VALIDATE SUBROUTINE CREATED"
390 END
400'
410 PRINT "ERROR in DATA STATEMENT - Check line " LINENO% : END
420'
430'** DATA STATEMENTS TO BUILD SUBROUTINE
440'
450 DATA   85, 139, 236, 139,  94,  10, 139, 119,  961
460 DATA    1, 139,  94,   8, 139, 127,   1,  51,  560
470 DATA  210,  86, 176,  15, 180,  41, 205,  33,  946
480 DATA   94,  60,   1, 117,   4,  29, 202,   1,  608
490 DATA    0, 128, 124,   1,  58, 117,  11, 131,  570
500 DATA  198,   2,  60, 255, 117,   4, 129, 202,  967
510 DATA    2,   0, 128, 125,   1,  32, 117,   7,  412
520 DATA  129, 202,   4,   0, 235,  53, 144, 176,  943
530 DATA   46, 185,   9,   0,  56,   4, 116,  15,  431
540 DATA  128,  60,  32, 116,  34,  70, 226, 244,  910
550 DATA  129, 202,   4,   0, 235,  29, 144,  70,  813
560 DATA  176,  32, 185,   4,   0,  56,   4, 116,  573
570 DATA   18,  56,   4, 116,  14,  70, 226, 249,  753
580 DATA  129, 202,   4,   0, 235,   5, 144, 129,  848
590 DATA  202,   8,   0, 139, 126,   6, 137,  21,  639
600 DATA   93, 202,   6,   0,   0,   0,   0,   0,  301
```

Figure 1.

another portion of memory. This didn't cause any problems in the operation of Validate, but it's an error that bears explaining and correcting.

An instruction such as OR CS:RETCD,08H uses the CS register (which normally points to the start of the subroutine) as the segment and ORs the word at the location of Retcd with the value 8H. In the assembler listing for the subroutine (see page 64 of the December 1983 issue), Retcd appears to be located at offset 3H from the start of the program. But things aren't always what they seem. Since the original assembly language program from which the data statements were built was written with an ORG 100H statement (meaning that the program started at 100H), Retcd's real address is 103H. Thus the assembler program erroneously ORs the word at 103H (instead of the word at 3H, as the listing correctly shows).

Tangled in the String. To compound the error, our Basic program stored the subroutine within a string variable named Subrt$. This means that the subroutine actually resided at an unknown address somewhere within Basic's data segment. To illustrate, let's assume that string Subrt$ is located at address FD63H (decimal 64867). Using the same OR instruction just mentioned, here's what took place (and why the subroutine as published was not relocatable).

In the subroutine, the CS register points to the start of Basic's data segment instead of to the start of the program. When the OR instruction acts upon the word it thinks to be Retcd, it's actually ORing the word located at offset 103H from the start of Basic's data segment. This means that whatever is located at that address is wiped out by the OR instruction—with downright dangerous potential consequences. An error such as this could easily cause a machine lockup.

Figures 1 through 3 list the remedies. The corrected program as listed in those figures is the work of Martin and shows one way that Validate could be made relocatable.

Figure 1 is the Basic program that builds the modified Validate subroutine. The only lines changed are line 90, where the length of the string holding the subroutine has been decreased, and lines 450 through 600, which contain the *data* statements holding the modified machine language code.

Figure 2 is the modified program to call Validate; here only the length of the string definition in line 70 is changed.

And figure 3 is the commented assembly listing of the modified subroutine. Each changed line contains an asterisk in the first position of the comment field.

Martin has used the DX register in place of the Retcd variable; so everything that takes place in the routine relating to variable Retcd now affects the DX register instead of acting directly upon a memory location. Our thanks to Martin for his contribution!

Just to set the record straight, the January "Basic/Assembly Line" subroutine, Directry, had a similar flaw, which was corrected in March.

Questions, Answers. A number of readers who own the *Macro Assembler* have by-passed the Basic listings published here and have entered the source code from the assembly listings. Several have asked how the assembler code gets converted to data statements.

The procedure goes something like this: The assembly program is written, assembled, and linked into an .exe file. The conversion from an .exe file to Basic data statements is accomplished with the help of a Basic program that by-passes the first sector of the .exe file (which contains the file header and some relocation information we don't need), reads the file byte by byte, and converts the file to the appropriate *data* statements. All that remains, then, is to write the Basic program that builds the subroutine, merge the *data* statements in, and insert comments as necessary.

Readers have also asked about what's involved in getting these subroutines to work within a compiled Basic program? The main thing to consider here is that the Basic compiler handles strings in a different way than interpretive Basic does.

Interpretive Basic uses a three-byte-long string descriptor: Byte 1 (maximum 255) contains the length of the string; bytes 2 and 3 hold its address in memory. In compiled Basic, the string descriptor is four bytes long (two bytes for the length and two bytes for the address).

An instruction such as MOV DI,1[BX] places into the DI register the address contained in the string descriptor pointed to by BX. To write this same instruction in such a way that it will work in compiled Basic, we must code it as MOV DI,2[BX]. Changing the displacement from 1 to 2 causes the address in the string descriptor to be accessed correctly. If we left the displacement as 1, then, instead of retrieving the address from the string descriptor, we'd get the high byte of the length—not what we had in mind at all.

Once you've identified what changes need to be made, making a subroutine compilable is usually a matter of modifying the corresponding *data* statement bytes and fixing the checksum figure at the end of each changed *data* statement. (An exception to this is the January Directry subroutine, which, because of its heavy reliance on stepping through tabled string descriptors, cannot be modified so simply.)

Thanks also to those who wrote with suggestions, ideas, and modifications that they've made to programs from past months. Ed Madory of Poughkeepsie, New York, made a couple of modifications to the Basic program that builds the assembler subroutines. He writes, "I added a couple of bells and whistles so that I would have some indication that something was happening while the subroutine was being

```
10 '***** THIS PROGRAM DEMONSTRATES THE VALIDATE SUBROUTINE*****
20 '
30 ' **** STORE VALIDATE SUBROUTINE IN STRING
40 '
50 KEY OFF
60 DEF SEG
70 SUBRT$ = STRING$(124,32)
80 SUBLC% = VARPTR(SUBRT$)
90 GOSUB 400          ' get subroutine location
100 BLOAD "VALIDATE",VALID
110 '
120 ' ** ASK FOR FILENAME
130 '
140 CLS
150 WORK$ = STRING$(16,32)
160 RETCD% = 0 : ERRCD% = 0
170 LOCATE 1,15 : PRINT "*** DEMONSTRATE VALIDATE SUBROUTINE***"
180 LOCATE 3,10 : INPUT "Filename is ",NM$ : NM$ = NM$ + " "
190 '
200 ' ** CALL TO VALIDATE SUBROUTINE
210 '
220 GOSUB 390
230 CALL VALID (NM$,WORK$,RETCD%)
240 '
250 ' ** DISPLAY RESULT OF VALIDATE
260 '
270 LOCATE 5,1
280 PRINT "Result of VALIDATE is. . ." : PRINT
290 IF (RETCD% AND 1) = 1 THEN PRINT "   Code 1 - Global name"
300 IF (RETCD% AND 2) = 2 THEN PRINT "   Code 2 - Invalid drive" : ERRCD% = 1
310 IF (RETCD% AND 4) = 4 THEN PRINT "   Code 4 - Invalid filename"  : ERRCD% = 1
320 IF (RETCD% AND 8) = 8 THEN PRINT "   Code 8 - No extension"
330 IF ERRCD% = 0 THEN PRINT SPC(12) "Filename checks out OK!"
340 IF ERRCD% = 0 THEN SOUND 500,1 : SOUND 400,1 ELSE SOUND 50,7
350 PRINT : PRINT "Press SPACE BAR to continue or (S) to Stop"
360 CN$ = INKEY$ : IF CN$ = "" THEN 360
370 IF CN$ = "S" OR CN$ = "s" THEN END
380 GOTO 140
390 '
400 ' ** RETRIEVE LOCATION OF SUBROUTINE
410 '
420 VALID = PEEK(SUBLC% + 1) + PEEK(SUBLC% + 2) * 256
430 RETURN
```

Figure 2.

built, and also because of the type of error I was making when typing in the *data* statements." The example he enclosed shows the addition of a *print* statement just after the reading of a *data* statement. Though this modification adds a little overhead to the program, it provides visual confirmation that something is indeed taking place.

The other change Madory made was checking the value of any *data* item read to see if it's greater than 255. If a comma has been left out or the value has been typed twice accidentally, the error will be detected. This change is a good idea, and in the future we'll be using a check of this type in the Basic program that builds our subroutines.

David Lesko of Champaign, Illinois, wrote regarding the March 1984 Basic program that illustrates the difference between the bubble and Shell sort techniques. "After keying in your program, adding more data, and adding a few statements to check the time required for each sort," Lesko said, "I found Shell to be faster—but the output incorrect."

Lesko is right. The problem stems from the fact that line 630 in figure 1 of the March column (page 56) was lacking an *int* function. The line should have read

```
630 GAP = INT (GAP / 2)
```

Once this change is made, the Shell example should sort any number of items correctly.

Almost everyone who wrote, including Mike Illich of Oak Park, Illinois, pointed out that in the program that builds the Shellsrt subroutine the checksum logic is in error, since the last *data* statement line never has a checksum performed on it. That observation is correct, and the problem has since been corrected. Thanks to everyone who took the time to write with comments and suggestions.

Next time in "The Basic/Assembly Line" we'll look at a Basic subroutine that calculates the proper *def seg* address at which to load an assembler subroutine. ▲

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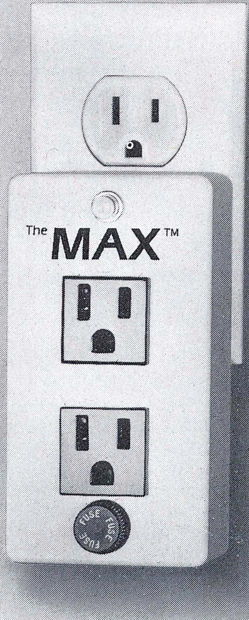

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```
                        ; VALIDATE (MODIFIED)
                        ;
                        ; WRITTEN BY HOWARD GLOSSER
                        ; MODIFIED BY T.P. MARTIN
                        ;
                        ; THIS ROUTINE WILL CHECK FOR VALID
                        ;    FILENAMES AND IS CALLED FROM BASIC
                        ;   (LINES MODIFIED CONTAIN  AN * IN COMMENTS SECTION)
                        ;
                        ;
                        ; RETURN CODE IS SET AS FOLLOWS...
                        ;
                        ;   01 - GLOBAL NAME
                        ;   02 - INVALID DRIVE
                        ;   04 - INVALID FILENAME
                        ;   08 - NO EXTENSION ON FILENAME
                        ;
0000                    CSEG      SEGMENT
                                  ASSUME CS:CSEG
0000                    VALIDATE  PROC       FAR
0000  55                          PUSH BP                  ;SAVE BP FOR FAR RETURN
0001  8B EC                       MOV BP,SP                ;MOVE STACK POINTER TO BP
0003  8B 5E 0A                    MOV BX,[BP]+10           ;POINT BX AT PARM 1
0006  8B 77 01                    MOV SI,1[BX]             ;GET FILENAME TO VALIDATE
0009  8B 5E 08                    MOV BX,[BP]+8            ;POINT BX AT PARM 2
000C  8B 7F 01                    MOV DI,1[BX]             ;GET WORKAREA
000F  33 D2                       XOR DX,DX                ;* CLEAR DX FOR RETURN CODE
0011  56                          PUSH SI                  ;SAVE SI REGISTER
0012  B0 0F                       MOV AL,0FH               ;BITS ON IN LOW AL REG FOR PARSE
0014  B4 29                       MOV AH,29H               ;SET UP FOR PARSING FILENAME
0016  CD 21                       INT 21H                  ;DOS DOES IT
0018  5E                          POP SI                   ;RESTORE SI REGISTER
0019  3C 01                       CMP AL,01H               ;DO WE HAVE A GLOBAL NAME?
001B  75 04                       JNE CKDRV                ;NO - CHECK DRIVE
001D  81 CA 0001                  OR DX,01H                ;* YES - INDICATE GLOBAL NAME
0021                    CKDRV:
0021  80 7C 01 3A                 CMP BYTE PTR [SI]+1,':'  ;IS THERE A DRIVE LETTER?
0025  75 0B                       JNE CKNAME               ;NO - CHECK THE NAME
0027  83 C6 02                    ADD SI,2                 ;POSITION SI PAST LETTER/COLON
002A  3C FF                       CMP AL,0FFH              ;YES - IS IT VALID
002C  75 04                       JNE CKNAME               ;YES - GO CHECK NAME
002E  81 CA 0002                  OR DX,02H                ;* NO - INDICATE INVALID DRIVE
0032                    CKNAME:
0032  80 7D 01 20                 CMP BYTE PTR [DI]+1,' '  ;INVALID CHARACTERS IN NAME
0036  75 07                       JNE SCANAME              ;NO - SCAN FOR NAME
0038  81 CA 0004                  OR DX,04H                ;* YES - INDICATE INVALID NAME
003C  EB 35 90                    JMP NAMEDONE             ;DONE - GO LEAVE SUBROUTINE
003F                    SCANAME:
003F  B0 2E                       MOV AL,'.'               ;SET AL FOR END OF NAME SCAN
0041  B9 0009                     MOV CX,9                 ;SCAN 9 CHARACTERS
0044                    NAMELOOP:
0044  38 04                       CMP BYTE PTR [SI],AL     ;GET A HIT ON '.'
0046  74 0F                       JE  CKEXT                ;YES - CHECK EXTENSION
0048  80 3C 20                    CMP BYTE PTR [SI],' '    ;HIT A BLANK
004B  74 22                       JE  NOEXT                ;YES - NO EXTENSION ON NAME
004D  46                          INC SI                   ;BUMP NAME ONE CHARACTER
004E  E2 F4                       LOOP NAMELOOP            ;DO AGAIN
0050  81 CA 0004                  OR  DX,04H               ;* GET HERE - NAME'S INVALID
0054  EB 1D 90                    JMP NAMEDONE             ;DONE - GO LEAVE SUBROUTINE
0057                    CKEXT:
0057  46                          INC SI                   ;BUMP SI PAST '.'
0058  B0 20                       MOV AL,' '               ;SET AL FOR EXTENSION SCAN
005A  B9 0004                     MOV CX,4                 ;SCAN 4 CHARACTERS
005D  38 04                       CMP BYTE PTR [SI],AL     ;GET A HIT ON ' ' AT START
005F  74 12                       JE NAMEDONE              ;YES - THERE'S NO ACTUAL EXT
0061                    EXTLOOP:
0061  38 04                       CMP BYTE PTR [SI],AL     ;GET A HIT ON ' '
0063  74 0E                       JE  NAMEDONE             ;YES - FILENAME IS OKAY
0065  46                          INC SI                   ;BUMP TO NEXT CHARACTER IN EXT
0066  E2 F9                       LOOP EXTLOOP             ;DO AGAIN
0068  81 CA 0004                  OR  DX,04H               ;* GET HERE - NAME'S INVALID
006C  EB 05 90                    JMP NAMEDONE             ;DONE - GO LEAVE SUBROUTINE
006F                    NOEXT:
006F  81 CA 0008                  OR DX,08H                ;* NO EXTENSION - INDICATE THIS
0073                    NAMEDONE:
0073  8B 7E 06                    MOV DI,[BP]+6            ;POINT DI AT PARM 3
0076  89 15                       MOV [DI],DX              ;* MOVE RETURN CODE FOR BASIC
0078  5D                          POP BP                   ;RESTORE BP
0079  CA 0006                     RET 6                    ;RETURN WITH 3 PARMS ON STACK
007C                    VALIDATE  ENDP
007C                    CSEG      ENDS
                                  END
```

Figure 3.

MARKETALK REVIEWS

Teach Yourself dBase II

This program is designed to teach a beginner how to use *dBase II.* It introduces a variety of ways to store and file records and print mailing labels and statements. What's more, it shows the user how to find this information again when he needs it. One section of the program and handbook teaches how to prepare, maintain, and monitor a database. And there's a useful trouble-shooting section that presents common error messages and tells the user what to do should they appear.

The program provides experience with the many steps and commands of *dBase II.* Unfortunately, though, a true novice might end up with only a vague idea of what he had learned. This is a lock-step program with no flexibility built in. Each command process is demonstrated in a packaged situation. The user types in exactly what the training package dictates and thereby successfully completes the process; but there's no opportunity to enter original commands or to stray in any way from the instruction path.

This program presupposes a fair knowledge of computer and business jargon. It also presupposes more comfort with the computer than many beginners feel. If you're a new user without an M.B.A., you may well finish working through the program and feel ready to return your computer to the store.

The documentation is nicely packaged in a looseleaf binder and slipcase, but the quality of the printing is poor. Darker type is used for emphasis; alas, it's often blurry and out of register.

A useful addition would be a glossary of commands and terms keyed to the pages where they appear. Also, this package would be more useful, interactive, and instructional if it taught one step at a time and then referred the learner to the appropriate section of the *dBase II* user guide for additional practice.

Although an important selling point of the program is that it can be completed in an hour or two, its effectiveness would be greater if mastery of each step were assured (or at least approached) before new information was presented. Even in the name of efficiency and speed, it seems logical to assume that a company owning a package like *dBase II* would be willing to invest more than two hours of an employee's time to ensure that the program was thoroughly understood.

—*Barbara Barnum*

Teach Yourself dBase II, American Training International (3770 Highland Avenue, Manhattan Beach, CA 90266; 213-546-5579). $75.

Banner

Want to make a big sign for your office? How about one that says, "Do Not Disturb" or "Assembler Spoken Here"?

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Banner is a well-designed new implementation of an idea that's been around since (at least) the earliest days of time-sharing. This new version is more flexible than most previous ones.

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Your banner will be printed in block letters that are about six inches high for one-line messages or two and a half inches high for two-liners. These block letters are composed from ordinary printer characters, much the same way a matrix printer forms normal-sized letters by using patterns of tiny dots. *Banner* lets you choose any printer character for forming the block characters, but it starts you off with pound signs.

Banner comes with a complete set (in the normal printable ASCII range) of block characters, but if you're not satisfied with the program's characters, you can modify them; you can also create your own characters from scratch.

Because *Banner* gives you a good deal of control over your printer, you can modify your signs extensively. For example, you can adjust the height of *Banner* characters by using compressed or expanded print

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modes; or you can use variable line spacing to compress or expand *Banner*'s output, thereby adjusting the total length of your message. *Banner*'s output can be made darker through emphasized printing (bold or shadow on a daisy-wheel printer). Changing the printer character used to form block letters will also affect image darkness. The program gives you full access to its printer driver table, including command sequences for starting and ending the printing job. You can put a forced page feed at the end of your output, for example. If you know your printer's command sequences, you're all set to tailor *Banner*'s output to your needs.

Best of all, *Banner* is easy to install and use. It's well prompted and entirely menu-driven, and the documentation is short but adequate. It requires only one floppy disk and 64K, so Junior owners can make banners too. If all this isn't enough, *Banner*'s source code (it's written in compiled BASIC) is included on the distribution disk, so you can modify the program for non-IBM computers or change it any other way you wish.

The only item on our "wish list" for *Banner* is that Sam Wilson would add the PC's graphics characters and provide for three-line banners. But you can't have everything for only $39.95.

—John Dickinson

Banner, Sam Wilson and Associates (Box 37085, Houston, TX 77237; 713-785-7830). $39.95.

Barney O'Blarney's Magic Spells

Barney O'Blarney's Magic Spells is a spelling game for children aged seven through eleven. The scenario is that Barney, a leprechaun, has hidden a pot of gold behind a tree in a forest and will provide clues as to the gold's location *if* several words are spelled correctly. The player sees a forest of identical trees, and, after a round of spelling, tries to identify by number the tree hiding the gold. Barney's clues tell the player, for example, that the number of the tree hiding the gold is "larger than ten," "does not end in five," and so forth.

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To get clues and earn a chance at finding the gold, players must spell three or four words correctly. A sentence, which is missing a word, is printed on the screen, and the player must type the correct spelling. The missing word *is* shown—for less than a second—above the sentence and "explodes" into a scattered set of letters. This way, the player has seen exactly what word is expected, although the context of each sentence makes it obvious anyway. Words are repeated throughout a particular level, and the drill and usage make for an effective learning experience. The difficulty level is selected at the beginning and can be increased as the game progresses.

Barney O'Blarney's Magic Spells makes good use of color and sound. The game opens with an Irish tune, and other tunes and sound effects liven things up during play. This is unusual in games of this type, which normally use sound only to open a game and at moments of "triumph." When the pot of gold finally is found, there is a brilliant, almost startling, flash of color. The forest where the gold is hidden is presented in bright shades of green, and each tree is wrapped with a red scarf.

Why a red scarf? That alludes to an Irish legend about a clever leprechaun who saved his gold *and* kept his promise not to remove a scarf marking its location. The story is included in the user manual and is well written, although uncredited.

The game uses the player's name, of course, and keeps track of names and progress for later use. The standard version of *Barney O'Blarney's Magic Spells* can keep track of three players; a classroom version can track up to thirty-five.

Other interesting features include the option of having the computer print a list of words that will be presented at the next level of difficulty and faster game play at the high levels (older children read faster). It also is possible for the parent or teacher to create an individualized word list, using a text editor or word processing program (preferably one that will number lines).

The music and "preview" of the word to be spelled can be omitted, as can the display of the letters of an "exploded" word. The preview time for words can be varied by hundredths of a second, and the pace of the game is variable as well. There also is the option of not allowing the correct spelling of misspelled words to be shown. These are valuable features, as they allow parents or teachers to customize the program in accordance with a child's ability.

The documentation is brief, clear, and to the point. The operation of the program presents no major problems for the child player or the adult "monitor." The many variable features and the game scenario make *Barney O'Blarney's Magic Spells* a real asset, at home or in school. If you're looking for a spelling tutor for your child, consider this one.

—Michael Banks

Barney O'Blarney's Magic Spells, Cum Laude Software (10221 Slater Avenue, Fountain Valley, CA 92708; 714-964-4075). Requires 128K, color/graphics adapter. $35.55.

Sargon III

Finally, you can give your hard-wired chess computer to Goodwill. *Sargon III*, the grandmaster of Apple chess programs, has just been released for the IBM, and it's a winner.

Moves are easy to enter: Simply type the coordinates of the *from* square followed by those of the *to* square. Using the algebraic notation common to most computer chess games, *Sargon* numbers the horizontal rows (ranks) 1 through 8 and designates the vertical rows (files) as A through H. For example, White would move her king's pawn by entering *E2-E4*. Although this isn't the standard algebraic notation of the U.S. Chess Federation (the above move would be e4 in that notation, for example), you'll quickly adapt to it. Even better, for the ultimate in high-tech chess, *Sargon* lets you move your pieces with a light pen. Just touch the square containing the piece you wish to move, and then touch the destination square.

You can set play at any of nine levels. The higher the level, the more half-moves ahead (plies) *Sargon* looks before deciding on a move. At level 1, the program takes about five seconds to make up its mind, while at level 8 it deliberates about ten minutes. To speed play, *Sargon* uses two tricks. Rather than thinking about every move, it relies on a library of preset opening moves (more than 68,000 of them) that follow well-accepted lines of play. Also, instead of contemplating its memory chips while you're thinking about your move, *Sargon* uses the time to consider possible responses. As a result, it plays a pretty mean game in a reasonable amount of time.

Sargon offers just about every option you can imagine. One of the most interesting is a special kibitz feature that will suggest a move for you. But don't make the mistake of thinking you can make *Sargon* beat itself; this program's no fool—it doesn't search as deeply for *your* best move as it does for its own. That means if you play nothing but the suggested moves, you'll probably lose.

Other options include watching *Sargon*'s search process as it decides on a move, changing the level of play during a game, taking back a move, changing sides with *Sargon* (a great ego saver), inverting the board so you can see things from *Sargon*'s point of view, setting up the board any way you want, and having *Sargon* play itself. You can also get a printout of moves and of the current board position, and you can save your game to disk. If you prefer playing a human opponent, *Sargon* will act as referee, making sure each move is legal.

In addition to the game disk, Hayden gives you a second floppy with 107 great games and a set of chess problems chosen by life master Boris Baczynskyj. Once you've watched the games and problems automatically played out on-screen, you'll wonder how you ever went through the tedium of making those moves yourself.

Unlike most other games, this one comes with a thorough manual—eighty-two pages' worth. In addition to quickstart and reference sections, it includes a set of chess rules and a discussion of strategy. You also get, at a reduced rate, a membership offer from the U.S. Chess Federation.

One minor criticism of *Sargon* is that it narcissistically reboots itself whenever you attempt to exit the program, unless you first remove the disk and replace it with another.

It's been a long wait for a chess game worthy of the PC; Dan and Kathe Spracklen have made the wait worthwhile.

—*Terry Tinsley Datz and F. Lloyd Datz*

Sargon III, by Dan and Kathe Spracklen, Hayden Software Company (600 Suffolk Street, Lowell, MA 01853; 800-343-1218). $49.95.

Sorcerer

Those insane geniuses at Infocom have done it again. Not content with *Enchanter*, they've released another text adventure as a sequel. This one is *Sorcerer*, and it has all the fanciful beasts, elaborate puzzles, and opportunities to get killed that made its predecessors famous.

Despite the flurry of interest in graphics adventures a year or so ago, Infocom has held fast to the concept of letting the player imagine his or her surroundings. This is much like the golden days of radio, when every listener could picture the rugged western terrain of the Lone Ranger or the city streets of the Thin Man. Like the special sounds of radio, the written descriptions in *Sorcerer* let each player visualize the environment. This appeal to the imagination, coupled with some excellent problems in logical reasoning, makes the game a good learning exercise for youngsters as well as a great diversion for adults.

Play begins with a description of the Twisted Forest, where you, the adventurer, are pursued by a savage Hellhound. If you manage to evade this beast (by typing in the direction in which you want to run), you will find yourself menaced by a giant snake, set upon by blood-drinking locusts, or blown up by a minefield. No matter what you do, the end is always the same. You meet a violent and gory death—only to awake, shaken, in your own quarters at the Enchanter's Guild. You are alone, and your task is to locate the missing head of the Guild, who has been spirited away by an evil force known only as Jeearr (lately of *Dallas*?).

Play revolves around magic spells, magic potions, and just plain whimsy. Each time you solve a puzzle, you're rewarded with a vial of magic potion or a magic scroll, which you can use in solving some later puzzle. Magic potions, identified by color, give you special powers that last for about a dozen moves. The amber Blort potion, for example, lets you see in the dark, while the aqua Fooble draught increases your hand-eye coordination. Another potion materializes a gnome with a hammer who whacks you on the head one thousand times and tells you you're having a good time.

Instead of the traditional adventurer's sword, you have a magic spell book, into which you can write the spells you find written on the scrolls. Once you've written a spell down (by using the magic word *gnusto*) you can learn it and use it in your adventures through abandoned Fort Griffspotter, the Amusement Park, and a host of other scenic attractions. One magic spell gives you glimpses of the future, which provide clues to solving some of the puzzles; another lets you fly through the air like a bird—for two moves.

One of the most interesting puzzles is the elaborate Glass Labyrinth, a maze in which the walls, ceilings, and floors are all invisible. Finding your way through it costs you a lot of painful knocks on the head and occasional plunges to a lower level. Another minor but nonetheless interesting problem involves the creature lurking in the bottom of an

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old cannon. Solving this puzzle depends on having your "infotator," which is a pictorial wheel included with the game. Revolving the wheel in its envelope lets you see the name, picture, and description of a dozen loathsome beasts. Included with each description is a five-element color code. The descriptions provide valuable clues to dealing with the creatures, and the color codes are absolutely necessary for moving from the Enchanter's Guild section to the main body of the game, which has numerous sections and about one hundred rooms.

Yes, the zorkmid is still the official medium of exchange, and this realm supposedly was founded by a relative of Dimwit Flathead III, whom aficionados will remember as the ruler of Zork. Our old friend the grue is back, too, but this time he's been mutated and can't be warded off with a simple brass lantern. There's a lot in *Sorcerer* that's familiar, which makes the new puzzles all the more amusing.

A couple of minor bugs remain in *Sorcerer*; they don't affect play but can be distracting. If you're taken over by the evil spirit, you get a final game score of -100 (and the rating "Menace to Society"); that final zero in -100 remains on the score line unless you reboot the game. This means your score is always shown as an order of ten higher than it really is, 4,000 instead of 400, for example. The other bug involves a major puzzle that uses a time-travel spell. If you die during this puzzle and are resurrected, the game displays an extraneous message at the resurrection point. (This temporal puzzle, incidentally, is one of the most ingenious problems ever seen in a text adventure.)

There are also a lot of red herrings, which adventure enthusiasts may find annoying. Since there are locations that can't be fully explored and objects that are included only for the mystification of the player, completing the game with a perfect score somehow fails to generate that fine feeling of having all the pieces fall into place that characterized earlier Infocom games.

Like its predecessors, *Sorcerer* is well packaged, with the infotator game wheel; an issue of *Popular Enchanting* that explains how to play the game, and a copy of *Our Circuits, Ourselves,* a tongue-in-cheek explanation of why America plays adventure games.

Since you can't get through the game without the infotator, Infocom has seriously hampered software pirates. *Sorcerer*'s infotator is difficult to copy on an office copier, and the game instructions are printed on a mottled brown background that also is hard to reproduce. You *can* make one copy of the game disk for backup.

Sorcerer, which can be played on the PC*jr,* has a save capability, with up to ten save points, as well as the ability to request a resurrection back to a specific place in the game. It takes about twenty hours to complete, depending on your experience with this kind of game.

—Dian Crayne

Sorcerer, Infocom (55 Wheeler Street, Cambridge, MA 02138; 617-492-1031). $49.95.

Active Trace

"See inside your program as it's working. Just as important, see inside your program when it's not quite working." So invites the ad for *Active Trace,* software that lives up to its promises. When a BASIC program doesn't work the way you want it to, this package of three programs, Goref, Vref, and Scope, will help you track the problem down.

The disk supplied with *Active Trace* is unprotected and contains the aforementioned programs as .exe modules. For those who own the Basic Compiler, the disk also includes the same programs ready for use with a copy of Basrun.exe.

Goref and Vref are mapping programs that respectively show you lines referenced by *gotos* and *gosubs* and all variables used within a program. Both can send output to disk or printer. The printed output is formatted and paginated.

Scope is a tool for the beginning, advanced, or professional programmer, and it begins where the cross-reference maps leave off. Scope shows the activity of your program line by line, displaying variable names and their contents.

You can use Scope's menu screens for making your run selections, or you can set up a command file to use on the command line when the Scope batch file is invoked. It's also possible to specify which variables are to be analyzed, and this option is certainly helpful; as the user manual points out, asking for all the variables to be analyzed can result in a display that's a bit overwhelming. Which line numbers to include or exclude from the trace also can be specified. In the case of an exclude, Scope simply ignores those lines as far as its variable display is concerned; it does *not* remove them from the program.

Scope can send output to screen, printer, or disk, although this last option is recommended for use only by those who thoroughly understand how BASIC operates; some decisions must be made by the user, and the wrong choice could erase a file. The manual, to its credit, gives a firm, clear warning to this effect. Alternate reserved-word lists for the particular BASIC being used also can be specified with Scope (as well as with Goref and Vref).

Once you choose your options, you can store them as a command file or you can begin running Scope. If Scope detects missing or contradictory information, it displays the appropriate submenu to obtain the missing or erroneous information.

If you build a command file, you can avoid the menu screens entirely. If you don't build one, you still have the option of executing Scope without using the main menu. In this case, the Scope program will load and the only prompt you'll receive is an inquiry about what variables you want traced. Once you supply this information, Scope processes your BASIC program (which must have been saved in ASCII) and runs it automatically.

Let's look at a simple BASIC program and the output that Scope

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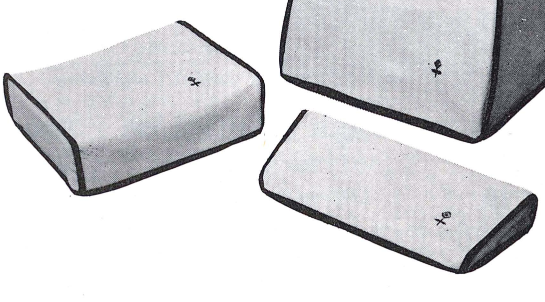

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would produce for it. First, the program:

```
100 INPUT "Name ";A$
110 FOR X = LEN(A$) TO 1 STEP -1
120   B$=B$ + MID$(A$,X,1)
130 NEXT
140 PRINT A$ " backwards is " B$
150 END
```

We'll answer the prompt for a name with "ROGER" and ask Scope to analyze the following variables: A$, B$, LEN, MID$, and X. Here is Scope's trace display for this program:

```
AT 100 A$=ROGER
AT 110 X= 5 LEN(A$)= 5 A$=ROGER
AT 120 B$=R MID$(A$,X,1)=R A$=ROGER X= 5
AT 110 X= 4 LEN(A$)= 5 A$=ROGER
AT 120 B$=RE MID$(A$,X,1)=E A$=ROGER X= 4
AT 110 X= 3 LEN(A$)= 5 A$=ROGER
AT 120 B$=REG MID$(A$,X,1)=G A$=ROGER X= 3
AT 110 X= 2 LEN(A$)= 5 A$=ROGER
AT 120 B$=REGO MID$(A$,X,1)=O A$=ROGER X= 2
AT 110 X= 1 LEN(A$)= 5 A$=ROGER
AT 120 B$=REGOR MID$(A$,X,1)=R A$=ROGER X= 1
AT 140 A$=ROGER B$=REGOR
```

Scope is a preprocessor. It reads your program in, analyzes which variables you want traced, and then creates a modified copy that when run will display the desired variables. The modified program is placed in a file with the default name $$$.bas; you can change the name. The program that really runs and displays the chosen variables is this modified version, not the original.

This preprocessor approach has minor drawbacks. First, additional code is inserted into a copy of your program. In some instances this inserted code might cause a line to exceed 255 characters (the maximum length for a Basic line). If this occurs, Scope places a warning message on the screen during the preprocessing.

As each line is analyzed, its line number is displayed. Scope checks to see whether Basic lines that contain strings have closing quotes. If they don't (which doesn't bother Basic at all), Scope beeps and displays a warning message (fortunately, it beeps only once if it finds a succession of lines missing the end quote mark).

Active Trace comes with a clearly written user's manual. It includes a section on structured programming that is interesting to read, and it has some good, instructive examples. The disk supplied also includes two short Basic programs that walk the user through a typical Scope session.

Avoiding mistakes when writing a program is more efficient than hunting them down later. However, when you encounter code that just doesn't work properly (or at least not the way you thought it would), *Active Trace* can help you find the problem.

—*Howard Glosser*

Active Trace, Awareco (38401 South Highway One, Gualala, CA 95445; 800-358-9120; 800-862-4948 in California). $79.95. Scope alone, $49.95.

Fraction Fever

One of the first non-IBM cartridges for the PC*jr* has just hit the market. The game is from Spinnaker, one of the most aggressive companies in the educational software business. *Fraction Fever,* which runs on a minimum (64K) PC*jr,* is a fast little game that depends on recognition of solid and hollow color blocks as fractions. It is intended for children from age 7 on up, but adults may find it amusing enough to play once or twice as well.

The player's piece is a little figure on a pogo stick who bounces along a path that is supposed to represent a floor in a high-rise building. A fraction, such as 3/4, is displayed at the top of the screen, and vertical stacks of blocks are displayed at intervals under the player's path. When the pogo stick reaches one of the stacks, the player can hit the space bar to erase it.

If the stack of blocks matches the fraction shown at the top of the screen, an elevator lifts the player to the next level, where play continues. If the stack of blocks doesn't match the displayed fraction, a hole appears in the floor and the pogo stick falls through to the next lower level—unless the player hits the up-arrow key to jump over the hole.

The pogo stick's direction is controlled by the right and left arrows, and speed is increased by the player's tapping the same key several times in succession. To slow down the pogo stick or change directions, the player must press the opposite arrow—and if the pogo stick is going at top speed, it might fall off the end of the path before the player can slow it down. This element of variability allows youngsters who are just beginning to use a slow speed until they're accustomed to the game.

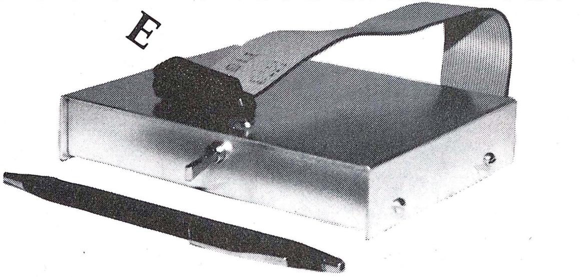
Some fractions are hard to identify, such as 7/8, which is represented by seven solid blocks and one hollow block. Few people can immediately recognize groups of more than six objects, and it may be hard for children to see the difference between 5/6 and 7/8 without counting the blocks. Also, fractions of whole numbers, like 6/6, seem pointless. Nevertheless, *Fraction Fever* is an attractive game that ought to have a lot of child appeal.

Spinnaker has taken to enclosing a special discount coupon in its packages that lets the purchaser get one free game in exchange for four or five proofs-of-purchase from other Spinnaker games. This is worth considering if you're collecting educational games for your children or if you're buying them for use in a primary school, since Spinnaker prices tend to be on the high side.

—*Dian Crayne*

Fraction Fever. Spinnaker Software (215 First Street, Cambridge, MA 02142; 617-868-4700). Runs only on PC*jr*. $34.95. ▲

IS SOM THING MISSING?



If your IBM PC system includes two printers, something may be missing. If you have to swap cables to go from checks to invoices, or from draft copy to final copy, *something IS missing:* **The Model 8310 Parallel Printer Switch from Felloe Corporation.**

The Model 8310 is a compact, reliable "A-B" printer switch for the use with the IBM PC and IBM-compatible parallel printers. It replaces old fashioned mechanical switches with modern CMOS solid-state circuitry.

The Model 8310 is supplied in a 4in. by 5in. by 1in. enclosure. Simply attach the built-in cable to the PC parallel port, then connect your printer cables to the 8310. A flip of the toggle switch on the 8310 selects the desired printer .

The 8310 comes with a 30 day "no questions asked" return policy and a 90 day warranty.

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MARKETALK NEWS

∆ Video training for *1-2-3* is available from **Learn-PC Video Systems** (3601 Wooddale Avenue South, Minneapolis, MN 55416; 612-546-6049). *Introduction to Lotus 1-2-3* includes a videotape, disk, guidebook, and command chart. It is available in both Beta and VHS formats. $495.

∆ *Starship Valiant*, from **Eagle Computer Consulting** (3000 North Wales Road, Norristown, PA 19403; 215-277-7638) pits players against Amdron invaders in galactic battle. One keystroke summons a help system that presents a comprehensive overview of the game and a step-by-step console explanation. Requires 128K, eighty-column display. $44.50.

∆ **Speech Plus** (461 North Bernardo Avenue, Mountain View, CA 94043; 415-964-7023) offers *CallText 5000*, a text-to-speech converter and telephone interface board that allows a user to access text data in voice through any Touch-Tone telephone. It provides voice output with unlimited vocabulary for the PC and can be programmed to answer the telephone, obtain text data from a host computer, and supply text data in voice to the caller. It can also initiate calls. $2,700.

∆ *Compiler Assist Program*, from **Slick Software** (Box 641, Harrisburg, NC 28705; 704-455-5927) is a tool for IBM Pascal programmers that analyzes the results from Pas1 and Pas2, setting the DOS error-level after each. This allows a batch file to check the error-level from one step before continuing to the next. When errors are found, compiler screen output is "locked" on the display until the user examines it. Requires IBM Pascal, DOS 2.0. $27.50.

∆ **AGC Corporation** (The Craigmiles Building, 170 North Ocoee Street, Cleveland, TN 37311; 615-478-3636) has created the *Interactive Church Information System*. The system includes a word processor with speller and thesaurus and a spreadsheet program. $5,440.

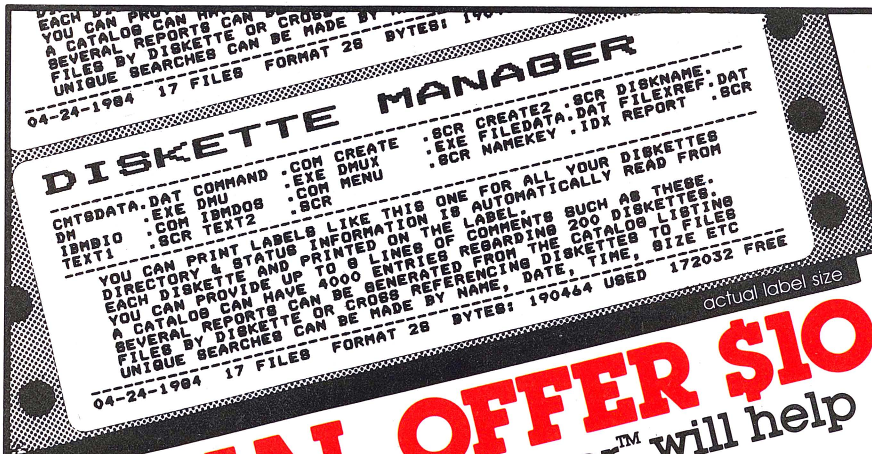
∆ *Samna Word III*, from **Samna Corporation** (2700 N.E. Expressway, Atlanta, GA 30345; 404-321-5006) is a word processor that features glossaries, user-defined function keys, five-function math, spelling-error detection and correction, column mode, automatic indexing, section numbering, table of contents generation, direct typing (keyboard to printer), international/special-purpose keyboard support, and full support for tree-structured file directories and subdirectories under DOS 2.0. $650.

∆ **RDT Software** (Box 96634, Weatherford, OK 73096; 405-772-1821) has released *Bugscreen*, a symbolic debugger that allows assembly language programmers to debug at the source level. Memory can be referenced with symbols from the source listing using the 8086 addressing modes. The program can display and test data in the form used by the procedure being debugged. $95.

∆ *Timeline*, from **Micro Program Designs** (5440 Crestline Road, Wilmington, DE 19808; 302-738-3798) is a tool for planning, scheduling, organizing, and managing time and time-based functions. It handles both discrete events, such as meetings and appointments, and time-span events, such as project steps and personnel assignments. $139.

∆ **Eagle Enterprises** (2375 Bush Street, San Francisco, CA 94115; 415-346-1249) has announced a full-function *General Ledger System* designed for business users with little accounting experience. The system automatically determines debits and credits for user transactions and prevents out-of-balance conditions. A built-in fixed-asset-management subsystem computes equipment depreciation and projects depreciation by month. $385.

∆ *The Hurricane Tracker*, from **Climate Assessment Technology** (11550 Fuqua, Houston, TX 77034; 713-484-3603) tracks hurricanes and tropical storms based on input of a storm's latitude and location as reported by the National



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DISKETTE MANAGER
-----------------------------------------------------------
CMTSDATA.DAT COMMAND .COM CREATE  .SCR CREATE2 .SCR DISKNAME.
DM      .EXE DMU     .EXE DMUX    .EXE FILEDATA.DAT FILEXREF.DAT
IBMBIO  .COM IBMDOS  .COM MENU    .SCR NAMEKEY .IDX REPORT  .SCR
TEXT1   .SCR TEXT2   .SCR
-----------------------------------------------------------
 YOU CAN PRINT LABELS LIKE THIS ONE FOR ALL YOUR DISKETTES
 DIRECTORY & STATUS INFORMATION IS AUTOMATICALLY READ FROM
 EACH DISKETTE AND PRINTED ON THE LABEL.
 YOU CAN PROVIDE UP TO 8 LINES OF COMMENTS SUCH AS THESE.
 A CATALOG CAN HAVE 4000 ENTRIES REGARDING 200 DISKETTES.
 SEVERAL REPORTS CAN BE GENERATED FROM THE CATALOG LISTING
 FILES BY DISKETTE OR CROSS REFERENCING DISKETTES TO FILES
 UNIQUE SEARCHES CAN BE MADE BY NAME, DATE, TIME, SIZE ETC
-----------------------------------------------------------
04-24-1984   17 FILES   FORMAT 28   BYTES: 190464 USED   172032 FREE
```

actual label size

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Weather Service. The program provides information about the storm's course, forward speed, distance from any potential point of landfall, and other parameters. Output is in the form of tables and a high-resolution map. Requires 128K, color/graphics card. $39.95.

Δ **Gold Hill Computers** (163 Harvard Street, Cambridge, MA 02139; 617-492-2071) has announced Golden Common Lisp, an extended subset of Common Lisp. The language offers a full range of data types, including closures, coroutines, vectors, multidimensional arrays, named structures, and single- and double-precision floating-point numbers. The 8087 coprocessor is supported. Requires 256K, DOS 2.0. $495.

Δ **IBM** (Box 1328, Boca Raton, FL 33432; 305-998-2000) has introduced several products and enhancements. Fortran Compiler Version 2.00 is an upgrade of the language for engineering and scientific applications. Programs are written in a version of Fortran-77 and then compiled to object code for execution. Requires 160K, DOS 2.0. $350. Upgrade for Version 1.00, $100. Δ Pascal Compiler Version 2.00 provides a system development environment for the creation and execution of Pascal programs. Requires 160K, DOS 2.0. $350. Upgrade for Version 1.00, $100. Δ *Private Tutor: Computers and Communications* is a tutorial that teaches the use of IBM personal computers in communications networks. It is designed for users who are interested in setting up their own communications networks. $35. Δ *PlannerCalc* is a spreadsheet for the home, business, or professional user. It includes twenty-five predefined applications that handle tasks ranging from personal budgeting to calculating mortgages to lease-versus-purchase analysis. Requires 128K, DOS 2.0. $79.95. Δ *Sort Version 1.00* provides a set of data record sorting and merging functions, available as either a standalone utility or from IBM Cobol. The package supports most IBM Cobol, Fortran, Pascal, and Basic data types and file organizations. A "modular exit" capability allows programmers to tailor it to their own purposes. Requires 128K. $175. Δ The 5531 Industrial Computer is an XT modified for the physical conditions of manufacturing environments—temperature extremes, vibration, voltage surges, shock, and dust. Each unit comes with 128K of memory installed in the system board, one double-sided disk drive, a ten-megabyte hard disk, a color/graphics adapter, and a combination adapter. $6,470.

Δ Two games have been announced by **Windmill Software** (Box 1008, Burlington, Ontario, L7P 3S9; 416-336-3353). *Rollo* is an arcade-style game in which you attempt to paint squares around the Brush brothers, Harry, Perry, and Swipe. Features include top thirty scores saved, multiple play levels, two-player option, and optional joystick control. Requires color/graphics card. $39.95. Δ *Digger* is an arcade-style game that involves searching for treasures when working to tunnel out of free-form mazes. Features include top ten scores saved, multiple play levels, two-player option, and optional joystick control. Requires color/graphics card. $39.95.

Δ **Prelude Corporation** (20380 Town Center Lane, Cupertino, CA 95014; 408-257-6033) has announced *Pro-Kit*, a multifunction expansion memory module that lets users expand PC*jr*'s memory by as much as an additional 512K. The product comes with a color-matched case and is installed on the PC*jr*'s I/O connector. In addition to extra memory, it includes an on-board quartz clock/calendar and a printer port. The unit comes with software that lets you use a portion of the extra memory as either a print spooler or for simulating a second disk drive. 64K version, $395. 128K version, $455.

Δ *Blossom*, a multifunction board upgradable to *PCnet*, has been announced by **Orchid Technology** (47790 Westinghouse Drive, Fremont, CA 94539; 415-490-8586). The board has up to 384K, a clock/calendar with an alarm, serial and parallel ports, and an onboard logic interface for *PCnet*, Orchid's local-area network. $395.

Δ **MicroPro** (33 San Pablo Avenue, San Ra-

Pascal and C Programmers

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Total string capability, complete screen access, keyboard handling a graphics interface, access to all BIOS functions, and much more are provided in over 40 routines. All routines are carefully crafted and documented to give you the information and flexibility you need. A general Macro Assembler BIOS gate allows you to access any BIOS function from Pascal or C, and demonstrates how to interface assembly language routines. Everyone using Pascal or C should have TOOLS. User Manual only, $30.

TOOLS 2 All Source Code is included

The power of DOS 2.0 is supported using high level Pascal procedures or C functions. Program chaining, DOS internal and external command execution, use of all available memory, extended file handling, and other utilities are some of the features provided. A general DOS gate allows you to access any DOS function from Pascal or C. User Manual only, $30.

VIEW MANAGER Source Code available

VIEW MANAGER is a screen support system of a mainframe for the IBM Personal Computer. VIEW MANAGER is a menu driven, screen oriented system allowing you to develop user oriented screen interfaces. Screens are constructed with a true Screen Painter supporting any attribute or color, and the screens are stored efficiently in a Screen Database. Database utilities allow you to copy screens to stand-alone databases and to archive screens. VIEW/LIBRARY supports access to screens and true block mode data capture and display from application programs. Available soon will be VIEW/LIBRARY for Microsoft (Lattice) C. The source to the procedure library is available for an additional $150.00. Demonstration diskette and User Manual $35.

VIEW MANAGER, TOOLS and TOOLS 2 run on the IBM Personal Com puter and XT. TOOLS 2 requires DOS 2.0; TOOLS and VIEW MANAGER can be used with any version of DOS. Specify if you wish Pascal (Microsoft and IBM) or Microsoft (Lattice) C versions. Blaise Computing can also provide you with the Microsoft Pascal and C compilers with qualified support. Call or write for details.

TOOLS	125.00
TOOLS 2	100.00
VIEW MANAGER	275.00
VIEW MANAGER (with Library Source)	425.00
MS-Pascal Compiler	275.00
Microsoft C Compiler	450.00

BLAISE COMPUTING INC.
2034 Blake St. Berkeley, CA 94704
415/540-5441

fael, CA 94903; 415-499-1200) has announced *CorrectStar,* a spelling checker based on the *American Heritage Dictionary,* for *WordStar* documents. The 65,000-word database has 99 percent of the most frequently used English words. The program also works with most other popular word processors. Requires 192K. $195. Upgrade from *SpellStar,* $85.

Δ *Printerface,* from **Datacon Associates** (2210 Wilshire Boulevard, Santa Monica, CA 90403; 213-476-1781), is a screen-oriented, menu-driven processor that lets users configure the state of their printers directly from the keyboard. The correct state of the configuration is shown on a status line under the master menu. As a user selects printer features, the program continues to show the options that have been selected as well as those that have not yet been chosen. Anadex and Toshiba, $95. All other printers, $59.

Δ **Programmed Press** (2301 Baylis Avenue, Elmont, NY 11003; 516-775-0933) has released *Investment Software Package,* an investment-oriented statistical software package of fifty programs for statistical forecasting, stocks, bonds, options, futures, and foreign exchange. Each Basic program is listed in the accompanying handbook. Software, $100. Handbook, $19.95.

Δ **Sapana Micro Software** (1305 South Rouse, Pittsburg, KS 66762; 316-231-5023) has announced *Sapana:Cardfile,* a filing system. Each entry can have from six to twenty-four fields and, in addition, can hold a text of up to 255 lines. The variable-length text uses only the disk space required and reallocates the available space to other entries dynamically. $195.

Δ **Phoenix Systems** (668 Fifty-First Street, Sacramento, CA 95819; 916-731-8224) has introduced *Menu Manager,* a hard-disk management system enabling the user to control access to a hard disk through definable menus. The program acts as a buffer between the user and the operating system. It can execute any command or program compatible with DOS 2.0 on a hard disk. Requires 128K, DOS 2.0. $100.

Δ *OptionVue Plus,* an option investment strategy program, is available from **Star Value Software** (12218 Scribe Drive, Austin, TX 78759; 512-837-5498). Incorporating the Dow Jones News/Retrieval service, the program is designed to allow investors to optimize current option positions and examine new investment opportunities instantly. Requires 192K, two disk drives, and a modem for access to Dow Jones. $495.

Δ **Cdex** (5050 El Camino Real, Los Altos, CA 94022; 415-964-7600) has introduced *Making Key Business Decisions Using Electronic Spreadsheets,* a tutorial in versions for *1-2-3, Multiplan,* and the *VisiCalc* and *SuperCalc* families. Each package has instructional and template disks along with a reference guide. The instruction provides a conceptual structure for teaching problem-solving skills as well as an overview of the dynamics behind decision-making techniques within business situations. $69.95.

Δ *Sign-Plot,* from **Centerpoint Computer Application** (500 North Michigan Avenue, Chicago, IL 60611; 312-467-0333), is a plotter program that allows the user to produce six different letter font styles with typeset quality for creating word charts. Upper and lower case, punctuation, and numbers are part of the font program. Requires 128K, two disk drives. $149.

Δ **Superex Business Software** (151 Ludlow Street, Yonkers, NY 10705; 914-964-5200) has introduced the *Superex Wholesaler,* an integrated package designed to handle all aspects of a wholesale operation. It helps keep track of credit lines and back orders, controls inventory, and does billings and accounts receivable. $600.

Δ **Data Consulting Group** (12 Skylark Drive, Larkspur, CA 94939; 415-927-0990) has announced two systems. *PC Time Accounting* is a time and material billing system that features up to 999 preset text records (up to 120 characters in length) for describing time or material. Requires two disk drives and printer. $295. Δ

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Δ **Microsoft** (10700 Northup Way, Bellevue, WA 98004; 206-828-8080) has introduced two products. *Microsoft Project* is a project-scheduling program that allows the general business manager to plan schedules, assign resources, and develop budgets for large or small projects. The program is designed to work much like a spreadsheet and features individual resource and cost tables, graphic displays of schedules and resource use, and reporting capability. It supports the Microsoft Mouse. Requires 128K. With mouse, requires 192K. $250. Δ A new version of *Flight Simulator* includes improved 3-D scenery, complete highway systems, and notable landmarks. Crash and sound effects have been improved, and more than eighty airports are featured. The program runs on both the PC and PC*jr* and will support a joystick or a Microsoft Mouse. Mouse requires 128K. $49.95.

Δ *Champion Business Accounting Software*, from **Champion Software** (66 South Van Gordon, Lakewood, CO 80228; 303-987-2588) is a complete accounting package consisting of five modules written in *dBase II*. The modules include general ledger and financial statements, accounts payable/purchase orders, inventory, payroll, and accounts receivable. Each module, $595.

Δ **National Softworks** (65 East Elizabeth Avenue, Bethlehem, PA 18018; 215-867-4800) has released *NLIB*, a library of nine assembler and C subroutines callable from Basic programs. With it, users can execute .com and .exe files; clear, scroll, save, and restore areas of the screen; display the system clock; accurately delay program execution; switch monitors; and flush the keyboard buffer. $49.95.

Δ **Learning Games** (Box 191, Lemont, PA 16851) offers *iRecipe 83*, a database index to 1,800 recipes found in the 1983 issues of *Family Circle* and *Woman's Day* magazines. It is available for *1-2-3*, *dBase II*, and *PC-FileIII*. $25.

Δ Three products have been announced by **BV Engineering** (Box 3429, Riverside, CA 92519; 714-781-0252). *ANAP* is an AC Network Analysis program that analyzes electronic circuits consisting of resistors, capacitors, inductors, and active components such as transistors and operational amplifiers. $49.95.

Δ *MicroPERT 0 Management System*, version 3, has been released by **Sheppard Software** (4750 Clough Creek Road, Redding, CA 96002; 916-222-1553). The program uses an "activity-on-arrow" approach to project networking. Requires 192K. $350.

Δ **Practicorp** (44 Oak Street, Newton Upper Falls, MA 02164; 617-965-9870) has introduced three programs. *Practiword* is an easy-to-run word processor with keyboard macros, indexing, and boilerplates. $99.95.

Δ *C Utilities Package*, from **Software Labs** (1221 Matisse Street, Sunnyvale, CA 94087; 408-730-8108), enables C programmers to call functions that control screen, peripherals, graphics, animation, and math functions. Requires 128K, two disk drives, C compiler. $119.

Δ Two offerings from **Fox & Geller** (604 Market Street, Elmwood Park, NJ 07407; 201-794-8883): *Grafox* is a business graphics package with full color capabilities that will draw information directly from any standard Basic file or via the DIF. The program is visually oriented and features menu-driven chart description procedures and single-keystroke commands for producing bar, pie, piebar, and line charts. $295. Δ *Oz: Management Control* integrates data analysis, graphics, and reports, offering financial control and 3-D views of data that will help control revenues and expenses, meet targets, and maximize profits. $495.

Δ Several education and entertainment programs have been released by **Sierra On-Line** (Sierra On-Line Building, Coarsegold, CA 93614; 209-683-6858). *Wiz Type* teaches typ-

IBM ANNOUNCES PRICE CUTS

On June 7, IBM announced price reductions for its Personal Computer line. The company also announced that the standard amount of memory on the PC and XT will now be 256K. The price reductions, ranging from 18 percent to 23 percent, cover not only the PC, XT, PC*jr*, and Portable PC, but also a wide range of hardware options.

The prices for the new 256K machines are as follows:

PC with one disk drive	$1,995
PC with two disk drives	$2,420
Portable PC with two disk drives	$3,020
XT	$4,395

The new and old prices for the earlier versions of the PC and XT (versions with less than 256K) and for the PC*jr* are:

	new	old
64K PC	$1,265	$1,355
64K PC with one disk drive	$1,815	$2,104
Portable PC with one disk drive	$2,595	$2,795
128K XT	$4,275	$4,995
64K PC*jr*	$599	$669
128K PC*jr* with disk drive	$999	$1,269

New and old prices for hardware options are:

	new	old
64K memory module	$100	$165
64/256 memory expansion card	$265	$350
Game control adapter	$45	$55
Prototype card	$35	$45
Communications adapter cable	$65	$75
Asynchronous communications adapter	$100	$120
Binary synchronous communications adapter	$240	$300
SDLC communications adapter synchronous data link control	$240	$300
Disk drive adapter	$125	$220
360K disk drive	$425	$529
Monochrome display and printer adapter	$250	$335
Printer adapter	$75	$150
Fixed disk drive adapter	$590	$695
PC expansion unit	$2,880	$3,390
XT expansion unit	$2,290	$2,695
10M fixed disk	$1,395	$1,695
8087 math coprocessor	$230	$260
Printer stand	$45	$55
Printer cable	$45	$55
Graphics printer	$449	$595
Monochrome display	$275	$345

How these price reductions will affect PC-compatible makers—who have profited from a shortage of PCs and who have kept their prices lower than IBM's—remains to be seen. Corona Data Systems (Thousand Oaks, CA) reduced prices from 11 to 20 percent on personal computers. Corona offers an entry price of $1,950, a 15 percent decrease. John Brown, senior vice president of sales for Eagle Computer (Los Gatos, CA), announced that Eagle would reduce prices to make them 10 percent lower than IBM's prices. Compaq Computer Corporation (Houston, TX) stated that it had no intention of lowering prices. ▲

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ing skills using characters from Johnny Hart's comic strip, "The Wizard of Id." Players can choose from several sources for the typing copy, including *A Tale of Two Cities*, *Hamlet*, Mother Goose rhymes, the Declaration of Independence, the Gettysburg Address, and "Cremation of Sam McGee."$34.95. Δ *Ultima II*, for the PC*jr*, is the second chapter of the role-playing game conceived by Lord British. A colorful cloth map helps chart the trip through time and space. $59.95. Δ *The Wizard and the Princess* is an adventure game that promises half the kingdom if the player can rescue the king's daughter, who has been kidnapped by an evil wizard. For the PC*jr*. $29.95. Δ Players are introduced to characters from Greek mythology on a search for the golden fleece in *Ulysses and the Golden Fleece*. For the PC*jr*. $32.95. Δ For younger adventure enthusiasts with PC*jr*s, there is *Troll's Tale*. The object is to find and return King Mark's missing treasures. The game features controlled vocabulary and focuses on reading comprehension, map reading, and lessons in logic. Included are a poster-size, fill-in map, sixteen stickers to be placed on the map, a compass decal, and a parents' guide. $29.95.

Δ **The Small Computer Company** (230 West Forty-First Street, New York, NY 10036; 212-398-9290) has announced *filePro 16*, a database program with relational capabilities. It maintains up to sixteen million records per file, 999 fields per record, and 4,608 characters in each record. Requires 256K, hard disk. $495.

Δ **Lewis Lee Corporation** (Box 51831, Palo Alto, CA 94303; 415-853-1220) has introduced *Bank President*, an educational business management game in which the player is CEO of a large commercial bank. Players can choose the type of bank they want to manage, set loan and deposit interest rates, raise or lower employee salaries, open or close branch offices, manage the bank's investment portfolio, issue common stock and capital notes, and set dividend policy. $74.95.

Δ *Wall Street Window*, from **R & D Software Associates** (Box 2727, Reston, VA 22090; 703-476-6597), is an integrated program that combines stock analysis techniques and portfolio management using automatic database communications, high-resolution color graphic displays, graphic printout, and spreadsheet interface. Requires 192K, two disk drives, DOS 2.0, color/graphics card, Hayes Smartmodem, *1-2-3*, and IBM-compatible printer. $395.

Δ **Lake Avenue Software** (77 North Oak Knoll, Pasadena, CA 91101; 818-792-1844) has announced *Junior Ledger*, a standalone general ledger/financial reporting system designed for small businesses. It is written entirely in *dBase II*. The menu-driven, double-entry bookkeeping system has a complete audit trail, full edit capabilities, and advanced error-detection routines. Requires 96K, two floppy-disk drives or one floppy and one hard disk drive. $195.

Δ FiXT, a plug-in chip that provides hard disk boot capability for several popular fixed-disk systems, is available from **Golden Bow Systems** (Box 3039, San Diego, CA 92103; 619-298-9349). The chip provides a complete BIOS interface between the PC and the hard disk system, similar to that provided by the XT. It allows the operating system to be booted directly from the fixed disk and allows fixed disk operations to be performed directly by the operating system. $70.

Δ **Hercules Computer Technology** (2550 Ninth Street, Berkeley, CA 94710; 415-540-6000) has introduced The Hercules Color Card, a color/graphics card half the size of the IBM card. It includes a parallel printer port. $245.

Δ **Lotus Development** (161 First Street, Cambridge, MA 02142; 617-492-7171) has announced versions of *1-2-3* for the 3270-PC and the PC*jr*. Requires memory upgrade for Junior. $495.

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SSEMBLE

Ray Duncan

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The "Direction Flag," which was mentioned briefly in an earlier column, determines whether the index registers will be incremented or decremented after each execution of a string instruction. This flag can be cleared (made 0) by the CLD (Clear Direction Flag) instruction, which causes index registers to be incremented, or it can be turned on by the STD (Set Direction Flag) command, in which case index registers are decremented. Once the flag is set or reset, it will not change until you explicitly alter it with another STD or CLD. You can use the PUSHF (Push Flags) instruction to inspect the current value of the flag—if you can think of a reason to!

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```
        LODSB
```

is equivalent to

```
        MOV     AL,[SI]
        INC     SI
```

while

```
        LODSW
```

is equivalent to

```
        MOV     AX,[SI]
        INC     SI
        INC     SI
```

The DS register may be overridden if necessary. LODS can be preceded by a REP prefix, but the utility of such a combination is not obvious to me. Perhaps this should be the subject of another contest!

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```
                STOSB

                Label2
                [DI],AL
                DI
                Label1
```

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OVSW. This instruction transfers the contents of the byte or word addressed by DS:SI to the address ES:DI, following which SI and DI are both incremented by 1 or by 2, as necessary. When MOVS is preceded by REP, the CX register is decremented following the transfer; if CX is nonzero, the MOVS is then repeated. The instruction sequence

```
                REP     MOVSB
```

is equivalent to

```
                JCXZ    Label2
                PUSH    AX
        Label1: MOV     AL,[SI]
                MOV     [DI],AL
                INC     SI
                INC     DI
                LOOP    Label1
                POP     AX
        Label2:
```

On 8088-based machines (such as the IBM PC), there is no disadvantage to using MOVSB over MOVSW, except that you can move a maximum of twice as many bytes with the latter. On 8086-based microcomputers, however, there may be a considerable speed advantage to using MOVSW if the beginning of the string is word-aligned. The association of DS with SI can be overridden by the programmer to any of the other segment registers; the combination of ES and DI, however, cannot be altered.

CMPS (Compare Strings). Written as

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ing skills using characters from Johnny Hart's comic strip, "The Wizard of Id." Players can choose from several sources for the typing copy, including *A Tale of Two Cities*, *Hamlet*, Mother Goose rhymes, the Declaration of Independence, the Gettysburg Address, and "Cremation of Sam McGee."$34.95. Δ *Ultima II*, for the PC*jr*, is the second chapter of the role-playing game conceived by Lord British. A colorful cloth map helps chart the
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logic. Included are a
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398-9290) has anno

base program with relational capabilities. It maintains up to sixteen million records per file, 999 fields per record, and 4,608 characters in each record. Requires 256K, hard disk. $495.

Δ **Lewis Lee Corporation** (Box 51831, Palo Alto, CA 94303; 415-853-1220) has introduced *Bank President*, an educational business management game in which the player is CEO of a large commercial bank. Players can choose the type of bank they want to manage, set loan and deposit interest rates, raise or lower em-
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II. The menu-driven, double-entry bookkeeping system has a complete audit trail, full edit capabilities, and advanced error-detection routines. Requires 96K, two floppy-disk drives or one floppy and one hard disk drive. $195.

Δ FiXT, a plug-in chip that provides hard disk boot capability for several popular fixed-disk systems, is available from **Golden Bow Systems** (Box 3039, San Diego, CA 92103; 619-298-9349). The chip provides a complete BIOS interface between the PC and the hard disk system, similar to that provided by the XT. It allows the operating system to be booted directly from the fixed disk and allows fixed disk
ns to be performed directly by the op-
ystem. $70.

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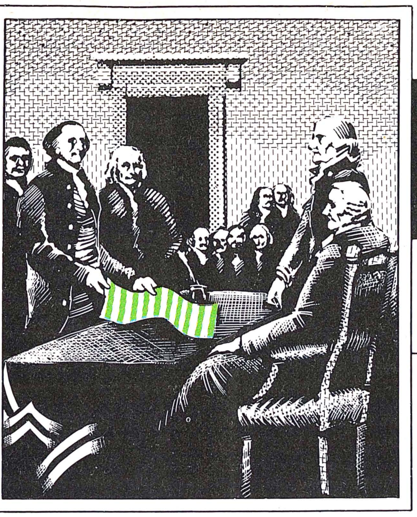

THE RIGHT TO ASSEMBLE

by Ray Duncan

8088 String Instructions

Our topic this time is the group of special string instructions which are an advanced feature of the Intel 8086/88 microprocessor family. These instructions, which were not present in any form on most of the eight-bit microprocessors, allow you—in a very efficient manner—to inspect, clear, move, compare, or translate a byte or word string.

All but one of these instructions come in two flavors: one flavor to operate on eight-bit data, the other to work on sixteen-bit data. This column will emphasize the eight-bit variety, but virtually all of the examples and comments can be generalized to the sixteen-bit string instructions as well.

When the string instructions are invoked, other registers and a dedicated CPU flag take on a special significance. The SI (Source Index) register is combined with the DS (Data Segment) register to specify the full address of the "source" data. For the instructions that transfer, compare, or store data, the DI (Destination Index) register is combined with the ES (Extra Segment) register to construct the address of the "destination" operand. The use of DS with SI can be overridden by the programmer to any of the other segment registers, but the combination of ES and DI is immutable.

The "Direction Flag," which was mentioned briefly in an earlier column, determines whether the index registers will be incremented or decremented after each execution of a string instruction. This flag can be cleared (made 0) by the CLD (Clear Direction Flag) instruction, which causes index registers to be incremented, or it can be turned on by the STD (Set Direction Flag) command, in which case index registers are decremented. Once the flag is set or reset, it will not change until you explicitly alter it with another STD or CLD. You can use the PUSHF (Push Flags) instruction to inspect the current value of the flag—if you can think of a reason to!

A string instruction may be preceded by one of three special "repeat" prefixes that cause an instruction to be repeated a specified number of times or until a condition is met. These prefixes are REP (Repeat While CX Not Zero), REPZ (Repeat While CX Not Zero and Zero Flag True), and REPNZ (Repeat While CX Not Zero and Zero Flag False). The number of iterations is always specified by the contents of the CX register (wherefore CX is often called the "count" register in Intel documentation); none of the other registers can be used to control the execution of string instructions. The REP prefixes will be discussed in greater detail later, along with the individual commands.

There is another prefix, LOCK, that can be associated with the special string instructions; it is employed only when several processors share the same memory, and discussion of its use is beyond the scope of this column.

Overview of the String Instructions

LODS (Load String). Usually written as LODSB or LODSW to indicate whether eight-bit or sixteen-bit data is being manipulated. You can also specify the width of the data by using a "dummy" operand, such as

```
        LODS   AL
```

but this format is clumsy and rarely used. LODS fetches the byte or word addressed by DS:SI into either the AL or AX register, then increments SI by 1 (byte transfer) or 2 (word transfer). So the instruction

```
        LODSB
```

is equivalent to

```
        MOV     AL,[SI]
        INC     SI
```

while

```
        LODSW
```

is equivalent to

```
        MOV     AX,[SI]
        INC     SI
        INC     SI
```

The DS register may be overridden if necessary. LODS can be preceded by a REP prefix, but the utility of such a combination is not obvious to me. Perhaps this should be the subject of another contest!

STOS (Store String). Coded as STOSB or STOSW to specify the operand size. This instruction writes the AL or AX register into the byte or word addressed by ES:DI, then increments DI by 1 (byte transfer) or 2 (word transfer). When the STOS is preceded by a REP, the CX register is decremented following the transfer and the STOS is repeated as long as CX remains nonzero. The instruction sequence

```
                REP        STOSB
```

is equivalent to

```
                JCXZ       Label2
        Label1: MOV        [DI],AL
                INC        DI
                LOOP       Label1
        Label2:
```

and will zero out a string of bytes. This is highly useful for initializing buffers and arrays (see next sample). A segment override is not allowed with the STOS instruction.

MOVS (Move String). Usually written as MOVSB or MOVSW. This instruction transfers the contents of the byte or word addressed by DS:SI to the address ES:DI, following which SI and DI are both incremented by 1 or by 2, as necessary. When MOVS is preceded by REP, the CX register is decremented following the transfer; if CX is nonzero, the MOVS is then repeated. The instruction sequence

```
                REP        MOVSB
```

is equivalent to

```
                JCXZ       Label2
                PUSH       AX
        Label1: MOV        AL,[SI]
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                INC        SI
                INC        DI
                LOOP       Label1
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        Label2:
```

On 8088-based machines (such as the IBM PC), there is no disadvantage to using MOVSB over MOVSW, except that you can move a maximum of twice as many bytes with the latter. On 8086-based microcomputers, however, there may be a considerable speed advantage to using MOVSW if the beginning of the string is word-aligned. The association of DS with SI can be overridden by the programmer to any of the other segment registers; the combination of ES and DI, however, cannot be altered.

CMPS (Compare Strings). Written as

CMPSB or CMPSW to select the eight-bit or sixteen-bit operation. CMPS compares the contents of the byte or word addressed by DS:SI to the byte or word addressed by ES:DI, then increments both SI and DI by 1 (byte transfer) or 2 (word transfer). If the CMPS instruction is preceded by the REPNZ prefix, it is repeated until two equal bytes are found (Zero Flag true) or CX is 0. If the REPZ prefix is used, the comparison will continue until nonequal bytes are found (Zero Flag false) or CX is 0. The fact that CX is decremented to 0 in this case does not affect the Zero Flag! This is very important, as it allows you to determine how the comparison has been terminated.

```
                REPZ        CMPSB
```

is equivalent to

```
                PUSH        AX
                JCXZ        Label2
      Label1:   MOV         AL,[SI]
                CMP         AL,[DI]
                INC         SI
                INC         DI
                JNZ         Label2
                LOOP        Label1
      Label2:   POP         AX
```

Notice that the index registers are incremented *before* the CPU decides whether to terminate the comparison; the registers will be left pointing one byte or word *past* the data you're interested in. The combination of DS and SI can be overridden.

SCAS (Scan String). Usually written as SCASB or SCASW. This instruction compares the AL or AX register with the byte or word addressed by ES:DI, then increments DI by 1 or by 2, as appropriate. If the SCAS instruction is preceded by the REPZ prefix, the operation is repeated until the compare is not equal (Zero Flag false) or the CX register becomes 0; if prefixed by REPNZ, the scan continues until the compare is equal (Zero Flag true) or CX is 0. The sequence

```
                REPNZ       SCASB
```

is equivalent to

```
      Label1:   CMP         AL,[DI]
                INC         DI
                JZ          Label2
                LOOP        Label1
      Label2:
```

XLAT (Translate String). This operation is somewhat different from the five that have already been described; since it works only on eight-bit data, it does not accept a repeat prefix and it doesn't use the DI and SI registers. XLAT replaces the contents of AL with the contents of the address DS:[BX+AL]; in other words, e. BX points to the base of a table, the value in AL provides an offset into that table, and the byte corresponding to that offset is transferred from memory into AL. So the instruction

```
        XLAT        AL
```

is equivalent to the very inefficient code sequence

```
        PUSH        BX
        PUSH        AX
        MOV         AH,0
        ADD         BX,AX
        POP         AX
        MOV         AL,[BX]
        POP         BX
```

This is a quick and dirty way to map one set of character codes onto another, to strip out certain undesired characters or to encode a text string. An example later in this column will make the usefulness of XLAT more evident.

Some Practical Examples

Initializing Buffers. Fill an area *count* bytes long starting at *addr* with question marks. This example assumes that the ES register is properly set.

```
        CLD
        MOV         AL,'?'
        MOV         CX,count
        MOV         DI,OFFSET addr
        REP         STOSB
```

Transfer Character String. Move a byte string *count* bytes long from *addr1* to *addr2*. Here we assume that DS and ES are properly set.

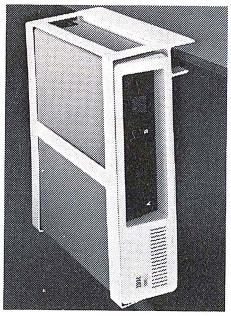
```
        CLD
        MOV         CX,count
        MOV         SI,OFFSET addr1
        MOV         DI,OFFSET addr2
        REP         MOVSB
```

Slide String. It is frequently necessary to move a list of bytes or word items up in memory one position to make room for a new item. For the purposes of this example, imagine we have an ASCII string *count* bytes long located at *addr1*, which we want to move up one byte so that we can insert a line feed at the beginning. We can't just use the string move shown in the previous example, because that would copy the first byte into the second byte, the second byte into the third byte, and so on, propagating the first byte throughout the entire string. Instead, we code:

```
        STD
        MOV         CX,count
        MOV         SI,OFFSET addr1
        MOV         DI,SI
        ADD         SI,CX
        ADD         DI,CX
        DEC         SI
        REP         MOVSB
```

If it's not immediately obvious to you what's going on in this code sequence, try diagramming it out. This type of fast slide is vital for the manipulation of lists of pointers.

Search for Character. Scan a character string at *addr* that is *count* bytes long to find the first instance of an ASCII "/". This example assumes that the ES register is properly set. Af-



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ter the instruction has been executed, a test of the Zero Flag reveals whether the desired character was found before the string was exhausted. The DI register is left pointing one byte beyond the "/" character (if such a character was present) or to the end of the string (if no such character was found).

```
        CLD
        MOV       AL,'/'
        MOV       CX,count
        MOV       DI,OFFSET addr
        REPNZ     SCASB
        JZ        FOUND
        JMP       NOT_FOUND
```

Ignore Leading Characters. This variation can be used to "scan off" leading delimiters. In this example, we'll skip over all the leading blanks in a string of *count* bytes located at *addr*. We assume that ES is already set. When the SCASB instruction finishes, the condition of the Zero Flag indicates whether any nonmatching character was encountered. The DI register is left pointing either one byte past the first nonmatching character or past the end of the string (if the string consisted entirely of the matched character).

```
        CLD
        MOV       AL,20H
        MOV       CX,count
        MOV       DI,OFFSET addr
        REPZ      SCASB
        JZ        ALL_BLANKS
        JMP     NON_BLANK_FOUND
```

Compare Strings. Test if the first *count* bytes of the strings at *DS:addr1* and *ES:addr2* are identical. The example assumes that DS and ES have already been set up. After the instruction has finished, the Zero Flag is true (set) if the strings were equal, and false (reset) if they differed. Registers SI and DI point one past the end of the strings if Z is true, or one byte past the first nonmatching character if Z is false.

```
        CLD
        MOV       CX,count
        MOV       SI,OFFSET addr1
        MOV       DI,OFFSET addr2
        REPZ      CMPSB
```

Translating Strings. Imagine that we have a string *count* characters long at *addr1*, which consists of ASCII characters. We wish to convert this into an equivalent string of EBCDIC character codes to be left at *addr2*. We have previously built an array named *table* in which each byte position corresponds to the numeric value of an ASCII character and contains the correct EBCDIC code for that character. Assuming that DS and ES are properly initialized, we can use a combination of LODSB, XLAT, and STOSB string instructions to translate the string rapidly and leave the result at *addr2*.

```
        CLD
        MOV       BX,OFFSET table
        MOV       CX,count
        MOV       SI,OFFSET addr1
        MOV       DI,OFFSET addr2
Label:  LODSB
        XLAT
        STOSB
        LOOP Label
```

Convert Byte to Word String. Here's an example that's particularly appropriate to programming on the PC. Consider the IBM monochrome display's refresh buffer, located in RAM at address 0B0000H. Each two bytes of the buffer correspond to one character seen on the screen. The first, or lower, byte of a pair contains the ASCII code for the character displayed. The second, or upper, byte of a pair contains the "attribute" code for the character; this code determines whether the character will be displayed as normal, reverse video, blinking, underlined, or intensified. Assume that we have a simple string of ASCII characters *count* bytes long located at *addr* and that we want to move this string to the beginning of the monochrome display buffer, simultaneously inserting the attribute code for "normal video" (which is 7) behind each ASCII code.

```
        MOV       AH,07  ;attribute
        MOV       CX,count
        MOV       SI,OFFSET addr
        MOV       DI,0B000H
        MOV       ES,DI
        MOV       DI,0
        CLD
Label:  LODSB           ;load AL
        STOSW           ;store AX
        LOOP Label
```

Of course, the preceding example is a considerably simplified version of the code that actual driver programs must use to control the video display. Note that we can't move immediate data into the ES register directly; instead we must use an intermediate general register. This illustrates one of the more glaring deficiencies in the 8086/88's instruction set, along with the lack of a direct segment-register to segment-register transfer command.

Remember, readers who subscribe to CompuServe can download the source for programs previously published in this column from the IBM PC Special Interest Group database. Programs currently available include:

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CLEAN	**Convert a *WordStar* or other document file into a normal text file**
TALK	**Dumb-terminal emulator**
DISKTYPE	**Report MS-DOS disk format type**
MARK	**Set file to normal, read-only, or hidden**
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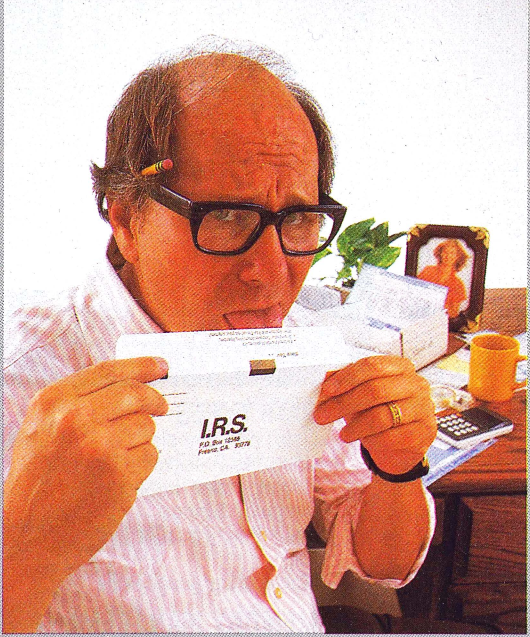

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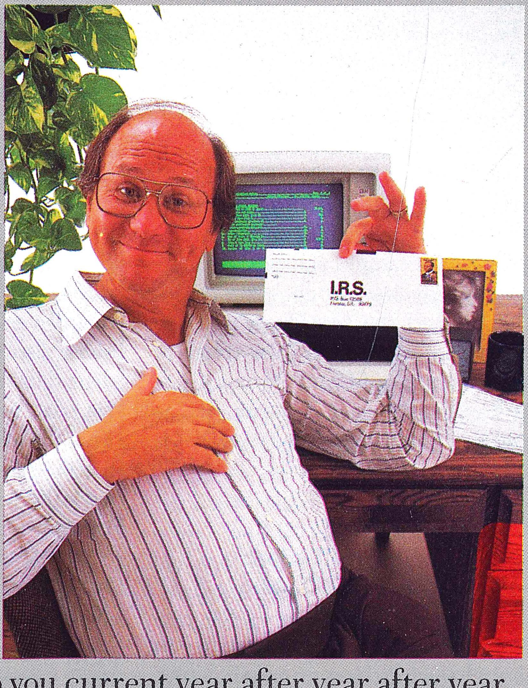

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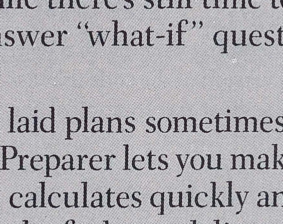

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It's time to say something nice about Junior. It isn't even very hard to do. . . . It's almost painless, in fact.

Junior is being given a hard time in almost every corner. Folks complain about price, performance, the keyboard, the sales, the lack of sales, the software, ad nauseum. What fun!

These are the critics, for the most part, who were hoping that IBM would fall on its face with the Personal Computer. It didn't, so they had to wait for Junior to get in their licks.

It's okay to climb on IBM's case over Junior. Every company needs a little humility, and that's not been one of IBM's more prominent characteristics recently. But the vituperation and diatribe should have reached a crescendo before this. Anyone who doubts the bandwagon effect in business should study the increasing criticism of Junior. As doubts about the machine have become almost conventional wisdom, everybody except Walter Mondale has jumped on the anti-Junior crusade.

So IBM didn't do its best job ever when it conceived Junior. No company always rises to the occasion. A quick reference to the Apple III supports this point.

In fact, there's more than a little resemblance in the situations of these two machines. Apple had had nothing but success with the Apple II. Hence, the Apple III. Apple made manufacturing and marketing mistakes that led to a poor reception in the marketplace. The Apple III actually sold reasonably well, oftentimes being among the top ten-selling micros in a given month. Yet it's now essentially a dead issue because Apple failed to address the problems of the III in a timely and effective manner.

Comes now the Junior. Again we find manufacturing and marketing mistakes. The keyboard can best be described as the unnatural child of inhuman parents. The machine was considered pricey in terms of price performance when rated against the competition. Junior-specific software did not flow from the systems houses like milk and honey.

Like Apple's attempt to crack the business market with the III, IBM was attempting to crack a new market for it—the home. Again like Apple, IBM seemed content to rest on its laurels, rather than coming to grips with the different circumstances of the different market. Actually, however, IBM is moving much more rapidly to correct the market's misperceptions of Junior than Apple ever did on the III.

The recent price reduction is a case in point. In Los Angeles, considered the most cutthroat retail computer market in the country by most savants, Junior was discounted the day adequate stocks were available to fill demand. Discount selling does not in itself reflect the true perceived value of a product; some of the discounting represents marketing ploys on the part of one or more sellers. But in Junior's case, much of the reduction appeared to be needed to bring the price into line with what buyers thought was a reasonable ticket for the machine.

IBM's aggressive move to bring the list price nearer the market price is a favorable sign.

The criticism of lack of software is relatively unsubstantial. Much of the best education, entertainment, and home software is now available for Junior. That fact goes unnoticed, because most of the hardware dealers don't carry broad inventories of software. To get a true impression of the depth of software available, you need to find one of the few full-service retail outlets or visit one of the better software-only stores.

This software is even selling in reasonable quantities. Seldom does a title reach the Top Thirty, but that mirrors the fact that there are multitudes more Personal Computers than Juniors installed.

Like the Apple III before it, Junior is not suffering so much a real failure as a perceived failure. The III didn't sell like the II, and Junior doesn't sell like the PC. But there are a couple of hundred microcompu-

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Charles Spezzano, Whole Earth Software Review, January 15, 1984

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Washington DC Capital PC User's Group Vol. 3, #4

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John Lombardi, Reviewer, InfoWorld, April 16, 1984

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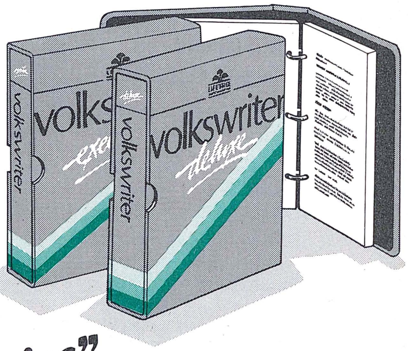

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ter manufacturers that wouldn't mind having Junior's sales numbers on their charts.

For readers who thought ahead and said to themselves, "Gee, May must have been a boring month for *Softalk* to be writing about Junior," you got it. Practically nothing significant happened.

Wizardry was the highest-placed newcomer at nineteenth. Two programs showing strength that may portend interesting situations down the road were *TIM IV* and *Open Access*. *TIM IV* is the latest reincarnation from Innovative Software and looks like it may be strong enough to battle Microrim's *R:Base 4000* and Ashton-Tate's *dBase II* and *Friday!*. *Open Access* is the first integrated program to join the Top Thirty since *1-2-3* pushed out *MBA*. *1-2-3* is currently in seven times as many retail outlets as *Open Access*, so it remains to be seen if the challenger should be taken seriously.

As always, the juggling among word processors was a high point. *MultiMate* retained the lead and its seventh position overall, while Microsoft's *Word* jumped to second in the category and ninth overall. *WordStar*, hanging in there against the newer generation of competitors, was third in the category and twelfth in the Top Thirty. Following were *WordPerfect* and *PFS:Write* in fifteenth and seventeenth. ▲

IBM-franchised retail stores representing approximately 4.78 percent of all sales of IBM and IBM-related Personal Computer products volunteered to participate in the poll.

Respondents were contacted early in June to ascertain their sales for the month of May.

The only criterion for inclusion on the list was the number of units sold; such other criteria as quality of product, profitability to the computer store, and personal preference of the individual respondents were not considered.

Respondents in June represented every geographical area of the continental United States.

Results of the responses were tabulated using a formula that resulted in the index number to the left of the program name in the Top Thirty listing. The index number is an arbitrary measure of relative strength of the programs listed. Index numbers are correlative only to the month in which they are printed; readers cannot assume that an index rating of 50 in one month represents equivalent sales to an index number of 50 in another month.

Probability of statistical error is plus or minus 3.78 percent, which translates roughly into the theoretical possibility of a change of 4.01 points, plus or minus, in any index number.

TOP THIRTY

This Month	Last Month	Index	
1	1	272.59	**1-2-3**, Mitch Kapor and Jonathan Sachs; Lotus Development
2	2	96.37	**dBase II**, Wayne Ratliff; Ashton-Tate
3	3	87.02	**Microsoft Flight Simulator**, Bruce Artwick; Microsoft
4	4	72.64	**Copy II Plus**; Central Point Software
5	4	69.04	**PFS:File**, John Page and D.D. Roberts; Software Publishing Corporation
6	6	51.78	**Crosstalk**; Microstuf
7	7	46.03	**MultiMate**; MultiMate International
8	13	44.59	**MasterType**, Bruce Zweig; Scarborough Systems
9	14	41.71	**Word**; Microsoft
10	15	38.12	**Norton Utilities**, Peter Norton; Peter Norton Inc.
11	12	34.52	**Multiplan**; Microsoft
12	9	33.80	**WordStar**; MicroPro
13	24	31.64	**Harvard Project Manager**; Harvard Systems
14	20	30.20	**Typing Tutor**, Michael Sierchio (Dick Ainsworth and Al Baker); IBM (Microsoft)
15	10	29.48	**WordPerfect**, Alan Ashton and Bruce Bastian; Satellite Software
16	16	28.76	**Sideways**; Funk Software
17	8	28.05	**PFS:Write**, Sam Edwards, Brad Crain, and Ed Mitchell; Software Publishing Corporation
18	21	27.33	**Dollars and Sense**, Frank E. Mullin; Monogram
19	—	25.17	**Wizardry**, Andrew Greenberg and Robert Woodhead; Sir-tech
20	11	23.73	**PFS:Report**, John Page; Software Publishing Corporation
21	17	23.37	**Home Accountant Plus**, Mike Farmer, Bob Schoenburg, Larry Grodin, and Steve Pollack; Arrays/Continental Software
22	18	22.29	**Zork I**; Infocom
23	30	21.57	**Friday!**; Ashton-Tate
24	25	19.41	**Asynchronous Communications Support 2.0**; IBM
25	21	16.54	**Basic Compiler**, Microsoft; IBM
26	23	16.36	**Macro Assembler**, Microsoft; IBM
27	29	16.18	**R:Base 4000**; Microrim
28	27	16.12	**Barron's SAT**; Barron's
29	—	15.82	**Zork III**; Infocom
30	—	10.78	**Zork II**; Infocom
	—	10.78	**TIM IV**; Innovative Software
	—	10.78	**Open Access**; Software Products International

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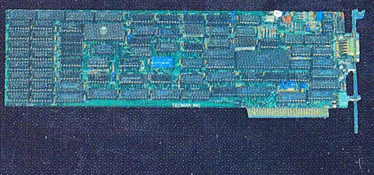

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